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The relationship between state and local taxation and state economic growth

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THE RELATIONSHIP BETWEEN STATE AND LOCAL TAXATION AND STATE ECONOMIC GROWTH

by

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WILLIAM R. INGRAM

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

In the United States today, the constantly growing population and a steady migration of people from rural areas to cities and from the interior of the cities to the outskirts place an ever-increasing demand upon local and state governments for additional and improved services. A growing populace with a rising standard of living requires more and improved roads, enlarged and improved schools, extended and modernized water and sanitation systems, enlarged and more highly developed police and fire protection systems, increased economic security for the aged, and modernized correctional and mental institutions.

The local and state governments' responsibilities necessarily require more and more revenue; accordingly, these governments are constandly probing for sources of revenue yield. This involves, among other actions, a continuous search for ways to obtain greater collections from taxation and exhaustive efforts to establish the optimum tax mix. Local governments, in particular, run into increased difficulties, because most local tax bases generally and historically have been narrowly concentrated on the property tax.

This increased demand for services and the resulting search for additional revenue has intensified the argument concerning the relationship between state and local tax differentials and state economic growth.

One highly vocal group insists that state and local taxes substantially affect the ability to save for investment purposes and that they deter decisions to invest; this group argues that taxes affect

the locational decisions of manufacturers and other businessmen. According to this group's reasoning, differentials in state economic progress over the past several years are inversely associated with the differentials in state and local tax burdens.

An opposing group argues that these "anti-tax" conclusions are erroneous--that state tax burdens at the levels which have existed historically have had inconsequential effect upon locational decisions and state economic growth. According to this group's reasoning, economic activity is based, in general, upon considerations far more important than the levels of state tax collections.

Adding impetus to the controversy has been the increasing tendency for state and local governments to give tax concessions and other inducements designed to influence decisions made by business executives. Table 1 demonstrates that as of 1962 fourteen states authorized property tax exemptions, and they were available illegally in fifteen states. Nineteen states authorized the issuance of bonds (revenue, general obligation, or both) to help finance industrial plants.

This study proposes to investigate the actual relationship between state and local taxes and state economic growth, and to determine whether or not states with relatively lower state and local tax burdens have prospered compared to others.

Chapter I reviews much of the literature devoted to investigations and articles concerning this subject. Vital and interesting points, summaries and conclusions are given as presented by each contributor. Although Chapter I is not designed to express specific agreement or disagreement with each of the various views, a very few

TABLE 1. Property tax exemptions available to new and expanded industries, 1962

State	Direct property tax exemptions to new or expanded industry?	County and city bonds for facilities?		"Sub rosa" tax concessions?[1]	Other state financial assistance?[2]
		Revenue	General obligation		
Alabama	Yes-10 yrs.[3]	Yes	Yes	...	No
Alaska	Yes-5-10 yrs.	No	No	...	Yes
Arizona	No[4]	No	No	No	No
Arkansas	Yes-7 yrs.[5]	Yes	Yes	...	No
California	No	No	No	No	No
Colorado	No	Yes	No	No	No
Connecticut	No	No	No	No	Yes
Delaware	No[6,11]	No	No	Yes	Yes
Florida	No	No	No	Yes	No
Georgia	No	Yes	No	No	Yes
Hawaii	Yes-5 yrs.[7,11]	No	No	...	No
Idaho	No	No	No	Yes	No
Illinois	No	Yes	No	Yes	Yes
Indiana	No	No	No	No	No
Iowa	No	No	No	No	No
Kansas	No	Yes	No	No	No
Kentucky	Yes-5 yrs.[8]	Yes	Yes	...	Yes
Louisiana	Yes-10 yrs.[9]	No	Yes	...	No
Maine	No	No	No	No	Yes
Maryland	Yes[10]	No	Yes	...	No
Massachusetts	No[11]	No	No	No	No
Michigan	No	No	No	Yes	No
Minnesota	No[12]	No	No	No	No
Mississippi	Yes-10 yrs.[13]	Yes	Yes	...	No
Missouri	No	Yes	Yes	Yes	No
Montana	Yes[14]	No	No	...	No
Nebraska	No	Yes	No	No	No
Nevada	No[15]	No	No	No	No
New Hampshire	No	No	No	No	Yes
New Jersey	No[16]	No	No	No	No
New Mexico	No	Yes	No	No	No
New York	No[11]	No	No	Yes	Yes
North Carolina	No	No	No	Yes	No
North Dakota	No	Yes	No	No	No
Ohio	No	No	No	No	No
Oklahoma	Yes-5 yrs.[17]	Yes	No	...	Yes
Oregon	Yes-2 yrs.[18]	No	No	...	No
Pennsylvania	No[11]	Yes	No	Yes	Yes

Table 1. (Continued)

State	Direct property tax exemptions to new or expanded industry?	County and city bonds for facilities? Revenue	General obligation	"Sub rosa" tax concessions?[1]	Other state financial assistance?[2]
Rhode Island	Yes-10 yrs.	No	No	...	Yes
South Carolina	Yes-5 yrs.[19]	No	No	...	No
South Dakota	No	No	No	No	No
Tennessee	No	Yes	Yes	Yes	No
Texas	No	No	No	Yes	No
Utah	No[20]	No	No	No	No
Vermont	Yes-10 yrs.[21]	Yes	No	...	Yes
Virginia	No[22]	No	No	Yes	No
Washington	No	No	No	Yes	No
West Virginia	No	No	No	Yes	Yes
Wisconsin	No	Yes	No	Yes	No
Wyoming	No	No	No	No	No

[1]Because of the difficulty in determining just what a tax exemption tax is and the impossibility of getting complete and accurate information on what is being done in all states, this list is in all probability incomplete. No attempt is made to specify whether states authorizing property tax exemptions for new industries also grant exemptions sub rosa.

[2]Indicates states which insure plant mortgages, lend money to community development corporations that build plants for leasing to industry, or give other similar assistance.

[3]No exemptions from school taxes. Land is not exempt from any taxes.

[4]Exempts all manufacturers' inventories.

[5]Applies only to textile mills.

[6]In 1960 Delaware repealed its law granting a 10-year exemption for new industrial real estate. Ch. 278, Delaware Laws of 1959.

[7]Applies only to pulp and paper mills.

[8]Only municipalities can give exemptions. Raw materials, goods in process and manufacturers' machinery for all industries are exempt from local taxes but subject to state levy.

[9]No exemption from school taxes.

[10]Local taxing jurisdictions may grant full or partial exemption of manufacturers' machinery, equipment or inventories for limited or indefinite period. Several jurisdictions use 10 years. One exempts manufacturing real estate for 10 years.

Table 1. (Continued)

[11]Personal property of all incorporated manufacturers is exempt in Massachusetts. In Delaware, Hawaii, New York and Pennsylvania personal property of all taxpayers is exempt.

[12]A 1951 law provides for permanent lower assessments on the real estate of new refineries.

[13]Mississippi also exempts for all industries finished goods inventories in hands of manufacturers, and property "in transit" is exempt while stored in the state. Such property may be divided, broken in bulk, labeled and relabeled or repacked without losing exemption.

[14]New industrial property assessed at 7% of full cash value for 3 years, thereafter at 30% which is ratio for real estate and for manufacturing and mining machinery. Other "classes" are assessed at ratios from 20% to 100%.

[15]Has "freeport" law under which goods shipped into state and destined for later shipment out of state are exempt while stored in the state. The goods may be "assembled, bound, joined, processed, disassembled, divided, cut, broken in bulk, relabeled, or repacked" while in storage without losing exemption.

[16]Inventories of raw materials, supplies and small tools of manufacturers are exempt. Other inventories assessed at a ratio one-fourth the ratio applied to other taxable property.

[17]Only municipalities may grant this exemption. Further, all textile mills are permitted to pay an "in lieu" tax of one-tenth of one percent of value of products manufactured.

[18]Applies only to buildings under construction. Oregon also has "freeport" law which exempts goods stored in transit and permits such goods to be "assembled, bound, joined, disassembled, divided, cut, broken in bulk, labeled, packaged, relabeled or repackaged."

[19]This exemption does not extend to school taxes. In addition, South Carolina has "freeport" law which exempts property stored in a warehouse while in transit and permits such property to be "assembled, bound, joined, processed, disassembled, divided, cut, broken in bulk, relabeled or repackaged" while in storage.

[20]Has "freeport" law which exempts property held in state 9 months or less for assembly, manufacturing, processing, or fabricating purposes if shipped into the state and destined for shipment out of state.

[21]Only municipalities may grant exemptions.

[22]Inventories of all manufacturers taxes by state at 75 cents per $100 of value and are totally exempt from local taxation.

Source: W. A. Johnson, "Industrial Tax Exemptions: Sound Investment or Foolish Give-away," National Tax Association Proceedings, 1962, pp. 433-34.

specific critical comments are made where there are gross errors of omission or logic.

The remainder of the study is an empirical inquiry into the relationship between variances in state economic growth and variances in state and local taxation. Simple correlation and regression techniques are employed in an attempt to determine whether deviations in indexes of state growth (dependent variables) are reliably associated with deviations in indexes of state tax burden (independent variables). The inquiry involves 48 states and covers two periods, 1947 through 1954 and 1954 through 1962. All basic data and information used in the empirical inquiry were obtained either from governmental documents or from books and articles published by reputable publishing houses.

The greater part of the analytical studies made over the years which deal with this controversy indicate that business concerns actually base their location decisions on factors other than the size and burden of a particular state's tax structure--and that state and local tax levels do not serve as predictors of economic activity and progress. The empirical evidence obtained from the analysis in our inquiry upholds this conclusion. Nothing in the results supports the concept that "high" taxes have retarded industrialization and overall economic activity or that "low" taxes have served as a basis for state economic growth. The results of our inquiry would seem to indicate that state-by-state differentials in business expansion and overall economic progress have depended on factors far more fundamental than the mere existence of state and local tax differences.

CHAPTER I

A REVIEW OF SOME OF THE LITERATURE

The effect of state and local taxation and preferential tax treatment upon locational decisions, business expansion, and state economic growth is highly controversial and has resulted in the production of a host of studies, articles, monographs, and books addressed to the subject. The advocates have employed a variety of methods which include both empirical and theoretical approaches--with which to arrive at their conclusions.

One type of empirical approach employs questionnaires to ascertain the determinants of firm expansion or relocation. Questionnaires in some instances are specifically designed to determine the influence of taxes upon business expansion or locational decisions. In other cases, a large number of considerations are listed and the firm is asked to rank each in order of the importance it plays in decision making.

Another empirical approach uses statistical analysis to determine the relationship between state and local tax burdens and economic growth. This technique normally involves the establishment of certain measures of economic growth and tax burden for a given number of states. Then some sort of statistical comparison is made to determine whether or not a significant correlation may be shown to exist between economic growth and the level of state and local taxation. Some of these undertakings are definitive tax burden/economic growth inquiries. Others

are addressed to the broader problem of determining the relationship between several presumed economic growth determinants and one or more measures of economic growth.

A third approach, which may be either theoretical or empirical in nature, involves the use of cost analysis in an effort to show whether or not state and local taxes, as an element of cost, are large enough to play a significant role in influencing decisions concerning firm expansion or relocation. Many of the empirical studies use business firms as a vehicle of analysis. Some use actual firms operating in more than one state. Others set up hypothetical firms in a variety of localities and states where the tax structures are different, and then attempt to compute the tax burden in each instance in relation to total cost, total value added, operating revenues, or profit. These tax burden values may then be related to the level of industrial development in each state to determine whether "high" business taxes have restricted economic growth.

Investigations by these various methods have resulted in conflicting conclusions concerning both the effects of state and local tax burdens upon business expansion and economic growth, and the validity and wisdom of the competition in which states and localities have engaged in an effort to attract and hold industry.

An intensive review of the literature reveals that most of the analytical contributors agree, in general, upon the major considerations which affect industrial location--such as markets, supply of raw materials (especially for supply oriented industries), supply of qualified labor, fuel supply, transportation facilities, and/or overall costs.

Many writers conclude that psychological factors, other personal factors, accident of residence, and other fortuitous circumstances serve important roles in location decisions.

Some investigators conclude that state and local taxes must be considered major influences upon business executives making decisions pertinent to business expansion or relocation. Others feel that the evidence furnished by their research demonstrates that differentials in state and local taxation have negligible effect upon locational decisions and industrial growth. According to some investigators even though taxes do not ordinarily play the major role, they may in special cases serve as deciding factors in determining business location and expansion.

Many writers allege that there are special problems connected with an anti-business image. Some of the authors insist that the tax climate, as a part of the overall business image, or general business reputation, causes business to exclude from consideration some states and localities. Others conclude that the importance of this factor is minute. Almost all of those on all sides of the controversy agree that fears generated by the possible effects of an adverse business climate or unfavorable image upon location decisions have an enduring influence upon state and local tax legislation.

Surveys

Several studies have sought through the survey method to determine from businessmen themselves why they choose a particular location or make the decision to expand. Earlier in the chapter, a distinction was made between the two types of survey inquiries: those inquiring

about the general factors affecting location and those specifically asking about tax influences. An excellent example of the latter is an inquiry conducted by Professor William D. Ross, who at that time was Dean, College of Commerce, Louisiana State University.[1] The express purpose of the survey was to determine the usefulness of exemptions in the Louisiana economic development program. The study covered exemptions granted between December, 1946, and June, 1950. Analysis of the survey (questionnaire) data suggested that out of a total of $355,121,753.60 in exempted investments, only $25,000,000 would have been lost--in other words would not have been invested in Louisiana--had the exemptions not existed.

Three conclusions emerged from this study:

1. Tax exemption as a device for inducing new industrial expansion which would not otherwise occur has produced meager results in Louisiana.

2. The cost of the program in terms of lost revenue is out of proportion to the direct results obtained.

3. The ten-year industrial tax exemption program for new industry in Louisiana should be re-evaluated.

In commenting on these results at the 1957 National Tax Association's annual conference Professor Ross made the following statement.

> With only rare and questionable exceptions, those who have sought to determine the effects of tax differentials on industrial expansion through the use of valid or empirical methods have failed to discover a demonstrable correlation between these differentials and industrial development.[2]

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[1]William D. Ross, "Tax Concessions and Their Effect," National Tax Association Proceedings, 1957, pp. 217-221.

[2]Ibid.

Ross also brought out two interesting reasons for the persistence of concessions and state and local tax differentials as a means to attract industry: first, that even though there is no conclusive evidence that "high" taxes are driving out industry, such might be the case if the differentials were great enough; and secondly, that even though taxes are a secondary consideration in plant location decisions, a tax differential or concession may be decisive when other considerations are equal.

My own conclusions, based on the empirical data and analysis of this study, bear out those of Ross' study, i.e., rapid increases in industrialization have not been linked with lower than average taxes.

Most other surveys reviewed inquired about the general factors affecting location and expansion. Representative of this type is a survey conducted in 1950 by the Institute for Social Research, University of Michigan.[3] The objective of the study was to establish the best ways to promote Michigan and advance its industrial position. The report, which was based upon personal interviews with a representative sample of approximately 200 manufacturers, included an investigation into important considerations pertaining to plant location.

In this Michigan study, the six most important location factors in the order given by the interviewees were:

1. Distance to markets.
2. Distance to material.
3. Productivity of workers.
4. Prevailing wage rates.
5. Attitude of the community.
6. Transportation facilities.

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[3]Institute for Social Research, Industrial Mobility in Michigan (Ann Arbor: The University of Michigan, 1950), p. 1.

Local taxes ranked eleventh in importance; state taxes ranked fourteenth out of a list of 24 factors in the location questionnaire.[4]

In 1952, Professor John D. Garwood of Kansas State College conducted a general survey study of the location processes employed by 116 firms that located in Colorado and Utah from January, 1946, through April, 1951.[5] Most of the data were obtained by personal interviews with officials and owners of the firms. Information derived from the survey pointed to five major economic forces responsible for attracting these firms to Colorado and Utah. In order of importance, these forces were markets, materials, labor, available sites and plant facilities, and climate. Other determinants, secondary in nature, were the need for decentralization and non-economic considerations. According to Professor Garwood, tax costs were hardly considered in the locational "analysis" employed by the firms involved in the survey. Company officials had only a vague idea of the state and local tax structures of Colorado and Utah. Garwood's conclusions were that the tax structure of a community has little to do with locational decisions and industrial development. Furthermore, to lower taxes in an effort to gain new industries may result in lowering revenues; at the very same time new industries are likely to require additional public expenditures for increased public services.

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[4] Ibid., p. 72. Although not pointed out by the authors of this report, it would be illogical to consider taxation unimportant based upon these results. Even though local taxes were eleventh in importance, the ratio of the importance of local taxes to the most important factor (distance to markets) was 64 percent. The ratio in the case of state taxes was 57 percent.

[5] John D. Garwood, "Taxes and Industrial Location," National Tax Journal, 5:368-369, 1952.

Using a personal interview approach, Alabama Polytechnic Institute's Professor Melvin L. Greenhut, in 1951, queried the management of eight small post-World War II firms in Alabama to determine prime location considerations. The findings highlighted the importance of personal factors:

> Five of the eight spokesmen stressed personal considerations as the dominant factor in their location; another mentioned this force as the secondary specific determinant.[6]

The remaining two firms used more traditional criteria in making their determination. One chose to minimize cost; one emphasized market as the prime determinant. The author gave no indication that state and local taxes played any part in the location decisions.

In 1959, Professor Greenhut conducted a survey study of 752 plants that had located in Florida in 1956 and 1957.[7] The objective of the survey was to ascertain which factors business executives deemed most important in attracting the firms to Florida. The survey concluded that 488 of the 752 plants used access to markets or anticipation of growth of markets as the general location factor; 164 of the firms cited access to markets or anticipation of growth as the second factor causing the firm to locate in Florida; and 72 referred to access to present and potential markets as the third most important consideration. In total, the access to present or potential markets was noted as a first, second,

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[6]Melvin L. Greenhut, "Observation of Motives to Industry Location," Southern Economic Journal, 18:227, October, 1951.

[7]Melvin L. Greenhut, "An Empirical Model and a Survey: New Plant Locations in Florida," Review of Economics and Statistics, (1959), p. 436.

or third factor 724 times.[8] Freight cost savings on the final product and on raw materials were next in importance. Other cost factors (which included state and municipal taxes) proved to be of little importance when these plants made their decisions to locate in Florida.

These findings are very similar to conclusions reached earlier by Professor Greenhut in his book, Plant Location in Theory and Practice.[9] Here he broke down the factors determining plant location into two broad categories: cost and demand. Even though taxes are considered as a processing cost, Greenhut found state and local taxes to be relatively unimportant in the location decisions. Given the governing factor, tax considerations in specific instances may determine the location, but this does not deter Professor Greenhut from the conviction that tax incentives and concessions are not significant factors in location, and that therefore there is little correlation between tax loads and industrial development.

An Oklahoma study conducted in 1954 is unique because it directly joins academicians with the business community in an effort to determine factors which influence economic growth. Professor Francis R. Cella and other members of the faculty of the University of Oklahoma combined with

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[8] Ibid., p. 437. It is interesting to note that the findings are in marked contrast to those from the earlier study by Professor Greenhut wherein five spokesmen out of eight stated that personal considerations were dominant in determining location. Professor Greenhut, noting this disparity in results, stated: "Possibly the difference in focus was the main influence, since in the earlier study interest is centered on the specific location, while in the later study the forces bringing the firm to the state are of central interest."

[9] Melvin L. Greenhut, Plant Location in Theory and Practice (Chapel Hill: 1956), pp. 137-139.

the Oklahoma Business Executives Research Committee to determine which forces have influenced manufacturers to locate in Oklahoma and what impelled other manufacturers to by-pass Oklahoma in favor of other states.[10] The data for the study were obtained by questionnaires which were mailed to industrialists who located new plants subsequent to World War II, either in Oklahoma or in the nearby states of Texas, Louisiana, Mississippi, Arkansas, and Kansas.

In an ordering of plant location factors by firms in the survey area, taxes were ranked twenty-fourth out of 34 factors considered. The most important location factors were stated to be availability of product markets, wages and salaries, abundance of general labor supply, labor's willingness to "put out" a full day's work, and workers' happiness and well-being. As a point of interest, according to the opinions expressed by some industrialists in Oklahoma, efforts to increase business and industrial taxes have an unfavorable influence on the minds of industrialists. "Unfair" taxes on business, they state, drive industry away and retard industrial development, but in the more specific responses to the questionnaires, this assertion is not borne out.

As a means of determining the general locational determinants of "footloose industries,"[11] an economist with the Stanford Research Center, Professor Robert G. Spiegelman, conducted, in 1963, a specialized

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[10] F. R. Cella, Factors Affecting Industrial Location in the Southwest (Norman: University of Oklahoma, 1954), pp. 5-24.

[11] The term "footloose" is applied to industries whose location is not dictated by the necessity of minimizing transportation costs for either output or material inputs; therefore, these industries have no strong locational pull either to markets or supply.

and revealing survey of the precision instrument industry.[12] The pattern of responses to questionnaires revealed that personal considerations were the most important factors in determining location. Other important considerations were availability of professional staff and availability of labor of required skill or ability. Markets, supply, transportation costs, and taxes play an insignificant part in the location process.

Statistical Studies

In 1938, Professor George A. Steiner of the University of Illinois conducted a statistical study to determine the relationship between tax burdens and industrial development. The Steiner study covered two periods, 1922 to 1929, and 1929 to 1935, and emcompassed nine states (Michigan, Illinois, Ohio, Wisconsin, Indiana, New York, Pennsylvania, Minnesota and Massachusetts) chosen for special analysis upon the basis of their tax burdens, geographical contiguity, and industrialization.[13] Twelve indexes or tests were used to compile a composite index of industrial development as a whole and also of manufacturing development as a part.[14] Ten indexes or tests were used to compile a composite tax burden

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[12]Robert G. Spiegelman, "Location Characteristics of Footloose Industries," Land Economics, 40(1):84, February, 1964.

[13]George O. Steiner, "The Tax System and Industrial Development," Bulletin of the National Tax Association, 23(4):98-101, January, 1938.

[14]Ibid., p. 100. Indexes of industrial development: 1) percentage growth in population; 2) percentage increase in total social income; 3) percentage increase in total per capita social income; 4) percentage increase in total social income less farm income; 5) percentage increase in net income less deficits of all corporations; 6) percentage increase in per capita wealth; 7) percentage increase in kilowatt hour sales to

comprised of the general tax burden and the tax burden upon manufacturing corporations.[15]

According to Professor Steiner, the composite indexes employed in a series of simple comparisons failed to reveal, in either period, any significant association between either manufacturing development or industrial development and the level of taxation.

In conjunction with this definitive tax inquiry, Professor Steiner ran a survey of 30 major industries to ascertain major locational determinants.[16] Results of the survey indicated that the most common factors that influence plant location are markets, labor, and transportation. Other locational factors of somewhat less importance, yet vital in the location decision processes, were shown to be power and fuel costs, available factory buildings, mergers and consolidations, and rents. As

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commercial customers; 8) percentage increase in net income of manufacturing corporations; 9) percentage increase in value of product added by manufacturers; 10) percentage increase in value of products of manufacturers; 11) percentage increase in wage earners in manufacturing establishments; 12) percentage increase in wages paid in manufacturing establishments.

[15] Ibid. Indexes of the general tax burden: 1) increase in total state and local tax collections; 2) ratio of per capita total state and local taxes to per capita social income, 1928-29-30 and 1933-34; 3) ratio of per capita total state and local taxes to per capita wealth, 1929 and 1932; 4) percentage increase of per capita property taxes; 5) absolute volume of per capita property taxes, 1929-30 and 1933-34; 6) ratio of per capita property taxes to total per capita state and local taxes, 1928-29 and 1933-34; 7) ratio of total state and local taxes to net profits of all corporations, 1926 to 1929 inclusive; 8) percentage increase in the ratio of total state and local taxes to net profits of all corporations, 1922-24 inclusive and 1928-29 inclusive.

Indexes of tax burdens upon manufacturing: 1) ratio of total state and local taxes to net profits of manufacturing corporations, average of four years, 1926 to 1929, and 1933; 2) results of a hypothetical corporation test for the years 1927 and 1935.

[16] Ibid., pp. 101-102.

in the statistical study, taxes were demonstrated to be of little importance in determining site location. Professor Steiner concluded:

> The results of this investigation can give but little comfort to those with the more extreme views concerning the migrating character of manufacturing capital and the effect of tax differentials upon such movements. . . . There is no question but that taxation might cause movements of marginal firms located in uneconomic places. On the whole, however, in interstate and interregional shifts of manufacturing establishments, taxation has been but a minor locational determinant. Tax systems existing in the nine states surveyed have not appreciably served to cause industrial migration. They have not fostered industrial development in prosperous years and have not prevented drastic industrial contraction in depression. The causes of such situations are much more fundamental than taxes.[17]

William A. Johnson, Commissioner of Revenue, State of North Carolina, in a 1962 presentation to the National Tax Association, also argued that state and local taxes have little effect upon the locational decisions of business and branded tax concessions to business firms for the purpose of luring them to selected sites as foolish giveaways. He presented inductive evidence and cited previously conducted surveys to support these conclusions.[18] He made a state-by-state tabulation of the percentage of increase and the per capita increase of value added by manufacture during the period 1947-1958. A comparison of these values with exemptions and concessions did not reveal any direct correlation between liberal tax treatment of manufacturers and value added by manufacture, either on a percentage or per capita basis. In fact, not one of the eleven states having the greatest percentage of increase in

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[17] Ibid., p. 110.

[18] William A. Johnson, "Industrial Tax Exemptions: Sound Investment or Foolish Give-away," National Tax Association Proceedings, 1962, pp. 421-432.

value added by manufacture granted legally authorized tax exemptions. Only two of the eleven had "bond programs" and the evidence indicates that there was little use made of these programs during the period under study.[19] According to Commissioner Johnson, the major determinants of plant and industrial location are accessibility to markets, wages, labor supply, and raw materials. A tax exemption or other concession, often temporary in nature and seldom of relative consequence, cannot--except under unusual circumstances--override these more basic economic factors.

Commissioner Johnson, expressing strong doubts as to the advisability of tax exemptions and concessions, suggested the following significant arguments to be considered by any state or community which embarks upon an industrial development program based upon special inducements to industry: 1) Continued use of exemptions and concessions endangers our economic system (which is based upon free enterprise) and drives an opening wedge for the socialization of our basic industries. 2) Concessions, inducements, and exemptions are all in the nature of a form of class legislation, which could easily open the door for more serious and far-reaching legislation that would favor one group over another. 3) Furthermore, new industries require additional services. Therefore, in addition to the increased financial burden involving concessions, there is also an additional community-borne expense for the required public services. At the same time that the requirements for services are increasing, the relative tax base is decreasing,

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[19]These are programs wherein the individual states provide direct loans to manufacturers and/or insure credit from private sources.

resulting in increased demands for revenue from those who remain unsubsidized. 4) Exemptions in one state may force still greater exemptions in another, and the ultimate results may be industrial warfare between states and localities. 5) The use of concessions in the form of tax exempt bonds threatens tax exemption principles enjoyed by state and local governments and may result in the abolishment of this exemption by the federal government. 6) At the same time, rising government credit for underwriting corporate enterprise could, in the case of a depression, result in financial catastrophe for both the government and the private sector, and could permanently impair the confidence of the public in state and municipal bonds.

A more elaborate statistical investigation of the relative growth in the 48 states and the relative tax burdens was conducted, in 1956, at the University of Iowa, by Professor Clark C. Bloom with the assistance of Albert A. Montgomery.[20] The inquiry was basically a tax study which did not isolate other determinants of economic growth. Employing simple correlation analysis, the authors compared growth in manufacturing employment and capital outlays of manufacturers to state and local tax collections and growth in these tax collections in the periods 1939-1953 and 1947-1953. The computations demonstrated that higher per capita levels of state and local taxes have not been associated with slower rates of manufacturing development. On the other hand, the computations revealed that per capita state and local taxes as a percent of per capita

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[20] C. C. Bloom and A. A. Montgomery, State and Local Tax Differentials and the Location of Manufacturing (Iowa City: State University of Iowa, 1956), pp. 12-15.

personal income tend to be lower where manufacturing looms more important. According to the authors, this result is brought about by higher income in manufacturing areas, not from lower taxes. The authors drew the following major conclusions.

1. Higher state and local tax collections per capita are not associated with slower rates of growth in manufacturing employment.

2. Higher service levels which generally accompany higher tax levies per person logically serve to encourage growth and thus to offset the depressive impact of tax collections.

3. Taxes levied directly upon manufacturers are relatively light and of minor importance when compared to other factors which impinge upon earnings.[21]

Probably the most sophisticated statistical study to date was made in 1957 and 1958 by Professors Wilbur R. Thompson and John M. Mattila of Wayne State University.[22] This is not a definitive tax study, but rather an attempt to analyze the forces which influence state growth. The inquiry, which covers the 48 states and the District of Columbia over the period 1947-1954, uses employment in 20 manufacturing industries as the index of industrial development. (The estimated average annual change in the number of workers employed in each of the 20 manufacturing industries made up the dependent variables.)[23]

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[21] Ibid., p. 40.

[22] Wilbur R. Thompson and John M. Mattila, An Econometric Model of Postwar State Industrial Development (Detroit: Wayne State University Press, 1959), pp. 3-11.

[23] The specific dependent variables describe the estimated average annual change in the number of workers employed in the following industries: 1) food and kindred products; 2) tobacco manufactures; 3) textile-mill products; 4) apparel and related products; 5) lumber and products; 6) furniture and fixtures; 7) paper and allied products; 8) printing and

According to the authors, employment was chosen as the index of industrial development because "good data were readily available" and also because "the number of jobs won or lost is an important index of community welfare." Sixteen presumed determinants of interstate differentials in industrial growth were selected as independent variables.[24] To complement the first analysis the authors made a second, parallel analysis which was couched in rates of change. In the second analysis the dependent variables and independent variables all appeared as rates of change or ratios. (Independent variables numbers 14 and 15, as indicated in footnote supra were deleted in the rate of change analysis.)

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publishing industries; 9) chemicals and allied products; 10) petroleum and coal products; 11) rubber products; 12) leather and leather products; 13) stone, clay, and glass products; 14) primary metal industries; 15) fabricated metal products; 16) machinery, except electrical; 17) electrical machinery; 18) transportation equipment; 19) instruments and related products; and 20) all manufacturing.

[24] Ibid., pp. 5-11. The selected independent variables in the first instance were: 1) average annual change in state population, 1940-47; 2) average annual change in state personal income, 1940-47; 3) average annual change in state personal income, 1945-48; 4) average annual change in total manufacturing employment, by states, 1938-47; 5) expenditures for new plant and equipment in all manufacturing industries, by states, 1947; 6) average annual number of patents and designs issued to residents, by states, 1946-48; 7) state and local taxes as a percent of state personal income, by states, 1953; 8) estimated state and local taxes paid by non-agricultural business per employee, by states, 1953; 9) average hourly earnings in manufacturing industries, by states, 1949; 10) estimated trade union memberships as a percent of non-agricultural employment, by states, 1947; 11) median years of school completed by persons 25 years old, and over, by states, 1950; 12) number of persons 25 years old and over who have completed four or more years of college, by states, 1950; 13) total staff, institutions of higher education, by states, 1947-48; 14) average annual number of selected patents, by industry, issued to residents, by states, 1947-48; 15) expenditures, by industry, for new plant and equipment, by states, 1947; 16) employment, by industry, by states, 1947.

The study used simple and multiple correlation and regression analysis to ascertain the nature and degree of the functional relationships.

This national statistical growth study concluded that state and local tax levels have no significant effect upon employment growth:

> State and local tax differentials, whether expressed more generally as a per cent of state income or more specifically as taxes paid by business per employee, appear to have no measurable effect on interstate differentials in employment growth in any of the twenty manufacturing industry groups. . . . The presumption is that either government provides a rough quid pro quo of services in return for taxes paid or that state and local taxes are relatively unimportant costs of doing business. But these results in no way prejudice the question of the tax sensitivity of narrower industry classes than the ones adopted or the intrastate locational effects of local tax differentials.[25]

The conclusions by Thompson and Mattila are closely related to the author's statistical findings in the empirical part of this study; i.e., large increases in personal income, value added by manufacture, and capital expenditures by manufacturers for new plant and equipment do not appear to be associated with lower than average state and local taxes.

Cost Analysis

Another highly interesting approach which can be employed to determine whether or not state and local taxation affects business expansion or relocation is cost analysis. Emphasizing this cost-of-doing-business approach, economists Jesse Burkhead and Donald C. Steele, in 1950, made the following statement.

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[25] Ibid., p. 73.

> Regardless of the hopes and fears of the combatants in the continued struggle over the level of state business taxation, there can be little doubt that the important element is the cost of doing business--both present and anticipated--and that this is the underlying determinant of migration and location of industry.[26]

Most all of those using the cost analysis approach in an effort to find certain answers relative to the controversy submerge the traditional factors of supply, labor cost, transportation costs, and taxes, into an overall cost consideration.

One group of those engaged in this controversy contends that reduced costs, increased sales, and efficiency resulting from a favorable location based upon a careful analysis of all factors will more than offset any disadvantage arising from unduly high state and local taxation. This group also attaches high importance to psychological and personal considerations and to special gains involving market selection and sources of raw material and labor, and argue that state and local taxation is not significant as a portion of overall costs. Furthermore, they say, any significance it might have is further reduced because all state and local business taxes are deductible in calculating federal income taxes.[27]

Others employing the cost analysis approach argue that, when non-tax costs are approximately equal among various possible sites, tax

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[26]Jesse Burkhead and Donald C. Steele, "The Effect of State Taxation on the Migration of Industry," Journal of Business, 23:167, July, 1950.

[27]This point, although not fallacious, is misleading. The simple truth is that all costs are reduced as a result of deductibility, and state and local taxes are not unique in this respect. The relative burden of each cost remains the same.

differentials may be large enough to be the determining factor in the choice of location. The argument continues that, even though state and local taxes represent only a small part of overall costs, the burden of such taxation does differ from state to state. The group which employs this general line of argument feels this tax difference is of high importance because at the same time that forces are working toward regional and national equalization of labor and capital costs, the benefits of location near raw materials or markets are fast being reduced by cheaper and faster transportation. They also feel that differences in taxes tend to originate in the differences in social and economic conditions existing among various areas and localities, and that these differences are likely to be reasonably permanent--all of which underscore their theory that state and local tax costs heavily influence investment decisions.

In 1928, the National Industrial Conference Board conducted an extensive examination of the fiscal issues and problems in New York State.[28] During the course of the study an effort was made to determine the distribution of the tax burden. Part of this exercise involved the drawing up of a financial statement for a hypothetical manufacturing corporation. The tax rates of New York and eight other industrial states then were applied to this hypothetical manufacturing corporation. The results indicated that New York was one of the more heavily taxing industrial states. The results also demonstrated that the taxing systems of these nine industrial states bore unequally upon manufacturing

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[28]National Industrial Conference Board, The Fiscal Problem in New York State (New York: 1928), pp. 117-121.

enterprise. Even though no attempt was made to correlate these tax differentials to industrial development, the study nevertheless concluded that such differentials may have an important influence upon location decision. The N.I.C.B. offered words of caution concerning the course of future tax legislation in New York State:

> While such discriminating differences in corporation tax burdens between competing industrial states may not be the determining factor in influencing the location of new industries or in causing a shift of established industries, they are frequently an important factor in such development. New York at present imposes a heavier tax burden upon its corporations than do many of the competing industrial states. The existence of this discrimination in tax burdens should be a deterrent against further increasing it. Future tax legislation should, if possible, avoid adding additional tax burdens to the present cost of New York corporate business.[29]

Economists Jesse Burkhead and Donald C. Steele disagree with the N.I.C.B. findings. They argue that state and local taxes are such a minor part of business costs they can have no effect on locational decisions--if businessmen act rationally and estimate their costs with reasonable precision. The authors based their conclusions on the results of a study of Pennsylvania state corporation taxes, which included the corporate income tax, the capital stock tax for domestic corporations, and its counterpart, the franchise tax for foreign corporations.[30] They took their information from a random sample of 889 corporation tax returns for 1947 selected from the files of the Pennsylvania Department of Revenue. (All inactive corporations and those not reporting income for 1947 were excluded, leaving 612 from which data were derived.) It was found that for 612 corporations the 1947 state corporation taxes

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[29] Ibid., pp. 120-121.

[30] Burkhead and Steele, op. cit., pp. 167-172.

amounted to an average of 0.55 percent of the total cost of doing business.[31] (A 1946 computation cited by the authors amounted to approximately the same value.) Citing this evidence, as well as the results of other studies, the authors concluded that the differentials which exist in state and local tax systems are unimportant in the location decision. Nevertheless, the threat of migration, hanging heavy over the heads of the legislators, often results in tax legislation favorable to business:

> The recent withdrawal of a prominent textile concern from New England and its announced intention to move to Puerto Rico to secure tax concessions (and other advantages) may have more effect upon the level of state and local taxes on business enterprise than all the quantitative analysis of economists.[32]

At the 1957 annual conference of the National Tax Association, Wayne State University's Wilbur R. Thompson, using the Burkhead and Steele study as support, as well as data derived from the Governor's Minnesota Tax Study Committee[33] and the Minnesota Department of Taxation, declared

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[31]It is interesting to note that many of the participants who feel state and local taxes are not a significant determinant in industrial location consider the burden of taxation in terms of its percentage of overall business expenses, rather than as a percentage of profit. In an article, "Some Difficulties with the Measurement of Comparative Tax Burdens," National Tax Association Proceedings, 1961, p. 158, Professor Reuben Z. Zubrow of the University of Colorado (who expresses some doubt about all the systems used to measure the importance of taxation on business location) argues that expressing the total tax burden as a percentage of profits before tax is much more meaningful than expressing the tax burden as a percentage of total business expense. Professor Zubrow pointed out that in a Colorado study it was found that the total amount of Colorado state and local taxes paid by 4700 corporations in 1958 averaged only 1.0 percent of their total gross operating revenues and 1.8 percent of their total business expense, but the tax-profit ratio was about 12.5 percent.

[32]Burkhead and Steele, loc. cit.

[33]Report of the Governor's Minnesota Tax Study Committee (St. Paul: 1954). The average state and local tax cost total cost ratio for all industries as derived from the "Minnesota study" was disclosed to be 0.85 percent. The state and local tax cost total cost ratio for manufacturing was 0.82 percent.

that state and local taxes as a portion of overall costs are insignificant in determining industrial location. On the other hand, the author found that labor, transportation, and fuel were highly important considerations in determining location. From the standpoint of costs, fuel's locational role was determined to be three times that of state and local taxes; transportation's role was determined to be somewhat greater than that of fuel, and labor's role fourteen times that of state and local taxes.[34]

Earlier, in 1943, Duke University's Professor Wilford J. Eiteman had conducted an inquiry into the effect of franchise tax costs on incorporation decisions. His conclusions were that franchise tax costs have a negligible effect upon the decisions to incorporate in any given state:

> If we assume that other location factors such as freight rates, access to raw materials, and nearness to markets are favorable to the high-tax state, franchise taxes neither encourage nor discourage incorporation in that state. If these factors are unfavorable to location in the high-tax state, an absence of all franchise taxes would not be enough to attract industries there.[35]

In a presentation to the National Tax Association at its 1951 annual conference, Professor Joe S. Floyd of the University of Florida argued that state and local taxes as a percentage of overall costs are significant in the decisions concerning industrial location.[36] According

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[34]Wilbur R. Thompson, "Importance of State and Local Taxes as Business Costs," National Tax Association Proceedings, 1957, pp. 185-189.

[35]Wilford J. Eiteman, "Effect of Franchise Taxes Upon Corporate Location," Southern Economic Journal, 9:240, January, 1943.

[36]Joe S. Floyd, "The Effect of State and Local Taxes Upon the Selection of Industrial Locations," National Tax Association Proceedings, 1951, pp. 437-445.

to Professor Floyd, the first consideration for any firm in the location process is to determine the market the plant is to serve. Then comes the site choice which rationally is determined by cost:

> Site choices, if made rationally, are determined by cost factors, since gross revenues are fixed by market conditions and therefore are identical at all sites within the market area. Thus total profits will be maximized by the selection of the site from which the firm can serve its chosen market at the lowest possible cost.[37]

Professor Floyd readily agrees that if higher than average taxes are offset by superior government services which do not benefit competing non-taxed firms, the "high" taxes have little influence on the competitive position. However, according to Floyd, higher than average taxes on industrial firms usually result in lower than average taxes on individuals. It follows that superior services are not forthcoming. The argument continues that industry often faces another serious problem which relates to an over-supply of services not required by industry. Floyd reasons that high expenditures on schools, public welfare, and highways often do not directly benefit industry--particularly over the short range.

If one concurs with Professor Floyd's concepts it would seem to follow that state and local taxes have a direct effect upon total costs and will influence the rationally made locational decisions of business executives. According to Floyd, the importance to location is intensified because these tax costs do vary, whereas many other costs are uniform, i.e., strong forces constantly work toward an equalization of labor, capital, and various other input costs. Also adding to the

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[37] Ibid.

importance of tax differentials is the ease with which the tax cost variation can be determined. Finally, Floyd reasons that these differentials are based upon deep-rooted social and economic conditions involving the distribution of population and resources, and, therefore, they are relatively permanent.[38]

To determine the degree of the differential in state and local tax burdens upon business, Professor Floyd studied the tax costs of various firms. This involved computing hypothetical tax bills for identical firms located in different communities in many different states scattered across the United States. Examination of the tax data of the selected urban-based hosiery company revealed that the actual difference between the highest and lowest state and local tax bills constituted 2 percent of the firm's sales and 4.76 percent of its net worth. For the rural-based hosiery company the difference between the highest and lowest tax bills was equal to 1.45 percent of its sales and 3.37 percent of its net worth. The difference between the highest and lowest state and local tax bills for the selected urban-based furniture company was 3.40 percent of sales and 7.42 percent of net worth. For the rural-based furniture company the difference between the highest and lowest tax bills was 1.72 percent of its sales and 3.75 percent of its net worth. According to Professor Floyd, tax differentials of this magnitude could influence site location.

Russell L. Hendricks, manager of the Tax Division, the Proctor and Gamble Company, in a presentation to the 1957 annual conference of

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[38]The concept that state and local tax costs are relatively fixed--and not subject to the same forces that tend to equalize other factor costs--is subject to question.

the National Tax Association, emphasized the effect of state and local taxes on locational decisions. Business should be strategically located with regard to source of raw materials, location of markets, and labor supply, but the location must also be advantageous from the overall cost standpoint.[39] In analyzing the cost factors, business must consider transportation, prevailing wage rates, fuel, power, and water costs, property values, construction costs, and state and local tax costs. According to Hendricks, state and local tax costs must be given ever-greater emphasis in the locational analysis because, relative to other costs, state and local taxes are increasing.

According to Mr. Hendricks, a state's tax structure should be carefully examined and evaluated prior to the formulation of any business expansion or location decision. Taxes of interest are corporation income taxes, franchise taxes based on income, franchise taxes based on capital, property taxes, sales and use taxes, unemployment insurance taxes, license and privilege fees, and other miscellaneous taxes. There must be a "spirit of cooperation" between the taxing jurisdiction and business. State and local officials must insure that their tax structure is such that business will desire to operate there. Business officials must, prior to location, consult with chambers of commerce and other state and local institutions to gain an insight into their "attitudes" toward business and to ascertain the character of the overall business climate.

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[39] Russell L. Hendricks, "The Influence of State and Local Taxes on Locational Decisions," National Tax Association Proceedings, 1957, pp. 191-200.

Chief of Research Paul A. Herbert of the Michigan Economic Development Department, in addressing the National Tax Association at its 1961 annual conference, also stressed the state and local tax cost in making locational decisions.[40] According to him, taxes had little to do with the early development of this country's industries; however, in recent years intense competition has developed for industry, and at the same time, the need for government services has increased and the requirement for tax revenue has increased accordingly. Thus, Herbert says, every businessman should examine closely the state and local tax burdens along with other costs, present and future, before making locational decisions.[41] Pointing out that even though the state and local tax costs are not the only ones that vary, he emphasized that these costs may vary relatively more sharply than others.

Herbert provided a final note of interest regarding the effect of taxes on location:

> It must be recognized that an increase in taxes will not immediately drive an industry out of a community. Regardless of the size of the increase it will add relatively little to the cost of doing business--certainly much less than the loss in immediately liquidating a large fixed investment in land and buildings, or the cost of moving equipment to a new location and the cost of the work interruption. However, high taxes will more immediately affect decisions in reference to the expansion of an industry.[42]

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[40]Paul A. Herbert, "The Effects of Taxation on Business Location and Development in a Highly Industrialized State," National Tax Association Proceedings, 1961, pp. 161-167.

[41]Recognized as additional locational determinants were certain non-economic factors, of which accident of residence is highly important. Many industries or firms are established and remain in a community because the owners like to live there.

[42]Herbert, op. cit., p. 167.

In a continuation of the thesis that taxes should be of major importance in location decisions, Leonard C. Yaseen, a senior partner of Fantus Factory Locating Service (1956), explains national plant location from the standpoint of market-and-cost.[43] Given the market, the eventual site should be the place where the total cost is least, assuming that the industry is socially and economically acceptable to the community. Yaseen gives due recognition to the tempering effect of federal taxation upon the impact of state and local taxes. Nevertheless, the consideration of importance should not be state and local taxes in isolation but the cumulative effect of these and other costs. Unfavorable state and local taxes, according to Yaseen, can in association with other costs cause plant relocation.[44]

Yaseen stated that tax rates are not a measure of the type of services rendered by a locality. Therefore, services should be carefully checked. In seeking a new plant location, cost and reliability of power, gas, water, rail and truck motor carrier service, workmen's compensation insurance, and all local and state taxation must be thoroughly examined. Every business executive must know whether the tax dollar is buying the desired measure (neither too much nor too little) of community services in the way of fire and police protection, schools, roads, sewage disposal, and other facilities. Yaseen stated:

> When all facts are known, the investigator should be in a position to assign a relative value to all production and distribution cost components. Raw materials, labor, utility

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[43]Leonard C. Yaseen, Plant Location (New York: American Research Council, 1956), p. 5.

[44]Ibid., p. 108.

costs, transportation, taxes, and plant overhead will then be seen in their true proportions.[45]

After the investigator has charted his market and has ascertained the geographic and cost implications of the necessary raw materials, labor requirements, power, fuel and water, and the effect of state and local taxes, Yaseen suggests a further examination of the community attitude as expressed in productive aggressiveness, law systems, law enforcement, overall state of discipline, and cultural development. When all these factors have been weighed, then a company can make significant judgments about tax costs relative to overall costs.

In 1958, Professor Alan K. Campbell employed the hypothetical firm technique (in concert with an analysis of state and local taxes as a percentage of gross sales) in an investigation of the influence of taxation upon locational decisions in the New York metropolitan region.[46] For purposes of this study, the region comprised 22 counties in three states: New York, New Jersey, and Connecticut. This area comprises a great number of state and local taxing jurisdictions characterized by many different rates and bases. The methodology involved setting up 25 hypothetical firms, each of which was located in each of 64 locations in all parts of the region. State and local taxes, including real and personal property taxes, corporate income taxes, corporate franchise taxes, gross receipts taxes, and unemployment compensation, were computed as accurately as possible. Tax levels in the various locations

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[45] Ibid., p. 10.

[46] Alan K. Campbell, "Taxes and Industrial Location in the New York Metropolitan Area," National Tax Journal, 11(3):200-209, September, 1958.

showed a wide range of difference. Professor Campbell stated that this is not due to a difference in state taxes, but to a difference in local taxes. The primary locational determinant of tax costs seemed to be population density--the larger and more populous a given area, the higher the taxes were. Accroding to Campbell, the results demonstrated that the combination of sparse population and highly concentrated use of property generally brings low levels of taxes.

Campbell concluded that if a company is making location decisions based upon rational considerations, different companies, depending upon their financial structure, will find their tax advantages at different locations. But, in general, to the extent that tax cost in the region does influence location, it will cause firms to move from central and large cities to less densely populated cities. However, the actual cost of taxes[47] compared to gross sales, as Professor Campbell sees it, indicates that taxes are a secondary consideration in location choice:

> Picture a hypothetical firm with sales of one million dollars and you get a state and local tax cost of $24,000 at one location and $7,000 at the other extreme. If all other factors could be assumed equal, it follows of course that differences within a range of this size would influence location decisions. But other factors push in various ways and are often bigger than tax cost. When other costs move in the same direction as taxes, the tax cost will give additional impetus to the force they exert. In most studies based on the interview technique industrialists tend to agree that taxes are a secondary consideration in the location choice, and the actual cost of taxes revealed here would tend to indicate the correctness of the view.[48]

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[47]Average tax cost for the 25 firms was about 1.5 percent of sales. The ratio swings from 2.4 percent at the location with the highest taxes to .7 percent at the location with the lowest taxes.

[48]Campbell, op. cit., p.209.

Miscellaneous Contributions

The tax manager of Union Carbide Corporation, Paul W. Smith, in a presentation to the National Tax Association annual conference in 1960, stated that items of importance to industry in making expansion and location plans are taxes, labor climate, transportation facilities, water power, and building costs.[49] He emphasized that when business and industry are contemplating expansion or relocation, state and local taxes are the subject of careful consideration, and pointed out that those states and localities that expect to attract new industries must insure that enabling tax legislation is effected.

Smith stressed the importance of a healthy business climate:

> State and local fiscal policies contribute substantially to what we call the business climate. For economic progress, it is vital that a healthy climate be maintained. Depending upon this factor are business decisions regarding plant location, expansion of plant, equipment turnover, policies regarding warehousing and inventory, purchasing policies, sales offices, etc.[50]

Smith also points out that state and local taxes are viewed as one package; therefore, states should be aggressive in coordinating state and local tax policies.

Charles P. McKeon, tax counsel for the California Company, in an address to the National Tax Association during its 1949 conference, emphasized the influence of state income taxes on business location.[51]

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[49]Paul W. Smith, "Local Permissive Taxes: An Industry Viewpoint," National Tax Association Proceedings, 1960, pp. 453-463.

[50]Ibid., p. 463.

[51]Charles P. McKeon, "The Effect of State Income Taxes on Business," National Tax Association Proceedings, 1949, p. 184.

He declared that unsatisfactory legislation or administration of state income tax laws will cause business to relocate or forego expansion in the state or locality responsible. Drawing attention to "heavy" tax burdens which business cannot overlook, he warned that those legislatures and industrial commissions possessing foresight and vision will gather facts upon which to base a fair and equitable tax structure and an industrial policy which will attract and hold industry.

Similar warnings against the effect of high taxes on business expansion and economic development were given to the state of Wisconsin in 1924 by the National Industrial Conference Board:

> In the field of special corporation taxation, as well as in the field of general property taxation, the policy and practice of Wisconsin tend to encourage the removal of large and prosperous concerns to adjoining states and to prevent large and prosperous enterprises from location in the state--a situation fraught with significant and far reaching potentialities.[52]

At the 1938 conference of the National Tax Association, University of Wisconsin Economist Harold M. Groves emphasized that any possible location advantage based on tax differentials and tax exemptions would be relatively minor.[53] First, he pointed out that the ratio of state and local tax burdens compared to the federal tax burden or to other costs is small. Secondly, he cited certain surveys and statistical studies, all of which failed to find a positive correlation between tax differentials and industrial development. Professor Groves recognized the vital part the fear of relocation plays on the actions of

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[52]National Industrial Conference Board, The Tax Problem in Wisconsin (New York: National Industrial Conference Board, 1924), p. 76.

[53]Harold M. Groves, "The Effect of Tax Differentials and Tax Exemption Upon the Relocation of Industry," National Tax Association Proceedings, 1938, pp. 557-566.

state legislators and city councils as regards the formulation of tax statutes and the development of overall tax systems for municipal, state, and local governments. He stated:

> There never has been a debate concerning the adoption of a state income tax in any state so far as the speaker knows, where the threat of industrial migration did not play a large part in the deliberation. If state legislatures are quite conscious of legislative incentives as a factor in industrial development, city councils are even more so. Recently the newspaper in a small city in Wisconsin published the following editorial comment. "It takes money to attract industry. With cities all over the country holding out large morsels as tempting bait, every industry is an economic sucker if it does not seek a city which gushes forth alms in order to get the company to locate there."[54]

Professor Groves expressed serious doubt that the granting of incentives and concessions in order to woo industry is an advisable practice. At any rate the municipality or state must determine, in every case, whether or not the firm eventually will be able to stand on its own financial feet and pay satisfactory wages and taxes. He implied that concessions and special inducements are inequitable and discriminating--that they must be borne by those who often do not receive the immediate benefit from them:

> It should be observed . . . that tax concessions and other inducements are at the expense of tax payers who do not receive them. In some cases they may be at the expense of taxpayers who compete directly or indirectly with the recipient of favors. In any event they are at the expense of the general taxpayer--the homeowner, wage-earner, merchant, professional men, and to a lesser extent the farmer.[55]

He concluded that were only one locality or community to follow the practice of granting concessions, the results for that community

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[54] Ibid., pp. 560-561.

[55] Ibid., p. 566.

could be favorable. However, concessions and the resulting favorable differentials in one community are followed by bigger concessions in others. Cutthroat competition and full scale economic warfare may result. The question arises as to when and where the competition will stop.

In 1961, Hofstra College Economist Marvin E. Lee presented to the annual conference of the National Tax Association a paper devoted to the effect of tax incentives upon the industrial development of the Southeast.[56] He stated that a major factor in formulating the locational decisions of a certain type of firm which has moved to the Southeast involved the pursuit of low priced labor. At the same time, these firms satisfy their desire to disperse the labor supply as a means of reducing union strength. (Other types of industries moving to the Southeast are supply oriented industries searching for water, timber, etc.) Professor Lee strongly suspects that the intense effort expended to attract industry to the Southeast was unnecessary--that the migration was not a result of tax incentives; rather, it was pretty much predetermined:

> One must draw the rather dismal conclusions that the industrial programs followed by many state and local governments of the South, in which tax incentives have been assigned a major role, were probably unnecessary to obtain relocation of the greater portion of the industry which located there in the past several years.

Professor Lee concluded:

> The people of the Southeast would obtain greater reward in recreating more equitable and democratically controlled taxing systems and by planned investment in their own potential and

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[56]Marvin E. Lee, "Tax Incentives and the Industrialization of the Southeast," National Tax Association Proceedings, 1961, pp. 173-174.

> and in their educational and public welfare institutions than they will find in continuing essentially unnecessary and wasteful tax competition.[57]

In 1961, Illinois Professor of Economics John F. Due reviewed many of the major studies concerning state and local tax influences on the location of industry.[58] On the basis of this exhaustive review, he concluded that the level of state and local taxes has practically no effect upon the locational decisions of business executives.

Professor Due pointed out that the general business reputation, in which taxes and the tax structure play active roles, influences some business location decisions--but the overall effect is negligible. Nevertheless, he says, the controversy concerning the effect of tax costs upon locational decisions often has a serious effect upon tax legislation. Many legislators fear that tax structures which displease businessmen will decidedly influence location and will result in economic stagnation. These fears are exaggerated through skillful propagandizing by business spokesmen.

Professor Due stated:

> The result is a potential danger of cutthroat competition, and more seriously in fact, a major obstacle to reform of tax structures. In terror of driving business out, legislatures become unwilling to adjust taxes to levels necessary to meet the desires of the community for services, and to bring the tax structure in line with popularly accepted ideas of equity in taxation.[59]

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[57] Ibid., p. 174.

[58] John F. Due, "Studies of State-Local Tax Influences on Location of Industry," National Tax Journal, 14(2):171, June, 1961.

[59] Ibid., p. 171.

This chapter reviews some of the literature concerning the relationship between state and local taxation and business locational decisions and/or economic growth. Some groups involved in the argument conclude that businessmen make location decisions on the basis of tax costs and/or incentives--and that state economic growth is slower where taxes are higher. However, the preponderance of analytical studies agree that locational decisions are made for more fundamental reasons--and that economic growth is not demonstrably associated with differentials in state and local taxes.

With this background in mind, we set up the following model to be used in an empirical investigation of the subject--the results of which will either uphold or discredit the findings of the literature concensus.

CHAPTER II

DESCRIPTION OF THE MODEL FOR THE EMPIRICAL INQUIRY

Objective and Scope

This inquiry is an empirical attempt to determine the association between the differentials in state economic growth and the differentials in state and local taxation. The model employs data from 48 states during each of two periods: 1947-1954 and 1954-1962. (Alaska and Hawaii are excluded because of the lack of data.) The selection of the years under study, 1947-1962, and the breakdown into two periods, 1947-1954 and 1954-1962, was not the result of an arbitrary decision. The year 1947 is the first post-World War II year for which reasonably sufficient data are available. The year 1947 also follows long enough after World War II to avoid most of the income, production, and fiscal distortions inherent in the war years. The year 1962 is the last year for which sufficient data are available. The two period model should prove meaningful where there are changes in state and local tax burdens from the first period to the second period that "might" have had significant influences on economic growth.[1] The employment of a two period analysis also permits us to relate interstate economic growth differentials

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[1]It may be argued that such changes are especially significant in cases where the changes in taxes between communities or between states are unequal. Even if the state and local tax burdens were to increase equally in each community and each state, it may be argued that these tax costs, as they become an ever-increasing percentage of total costs, will become more critical as a locational and growth determinant.

in the second period to state and local tax burdens in the first period. An examination of the results reveals whether there is merit to the argument that tax burdens of an earlier period may have had significant effects upon the decisions of businessmen that did not "show up" until later.

The Dependent Variables

The model measures growth through the use of three basic dependent variable groups: change in personal income, change in value added by manufacture, and change in capital expenditures by manufacturers for new plant and equipment. (Pertinent definitions can be found on pages 145-149 of this study.) A further breakdown of these dependent variable groups results in a total of eighteen variables which are used as indicators or indexes of state economic growth.

Description of the Growth Indexes

Change in personal income

Y_1 Total change in personal income, by states, 1947-1954.

Y_2 Total change in personal income, by states, 1954-1962.

Y_3 Per capita change in personal income, by states, 1947-1954.

Y_4 Per capita change in personal income, by states, 1954-1962.

Y_5 Percentage change in personal income, by states, 1947-1954.

Y_6 Percentage change in personal income, by states, 1954-1962.

Change in value added by manufacture

Y_7 Total change in value added by manufacture, by states, 1947-1954.

Y_8 Total change in value added by manufacture, by states, 1954-1962.

Y_9 Per capita change in value added by manufacture, by states, 1947-1954.

Y_{10} Per capita change in value added by manufacture, by states, 1954-1962.

Y_{11} Percentage change in value added by manufacture, by states, 1947-1954.

Y_{12} Percentage change in value added by manufacture, by states, 1954-1962.

Change in capital expenditures by manufacturers for new plant and equipment

Y_{13} Total change in capital expenditures by manufacturers for new plant and equipment, by states, 1951-1954.

Y_{14} Total change in capital expenditures by manufacturers for new plant and equipment, by states, 1954-1962.

Y_{15} Per capita change in capital expenditures by manufacturers for new plant and equipment, by states, 1951-1954.

Y_{16} Per capita change in capital expenditures by manufacturers for new plant and equipment, by states, 1954-1962.

Y_{17} Percentage change in capital expenditures by manufacturers for new plant and equipment, by states, 1951-1954.

Y_{18} Percentage change in capital expenditures by manufacturers for new plant and equipment, by states, 1954-1962.

Rationale Employed in Selecting the Growth Indexes

One basis for selection common to all of the dependent variable groups was the availability of reasonably accurate raw data which could be used to calculate the specific dependent variables.

Change in personal income. Personal income received by the populace is the most comprehensive measure of economic activity and is, also, universally accepted as the best indicator of overall economic welfare. For these reasons change in personal income is determined to be the strongest index of state economic growth.

Change in value added by manufacture. The economic activity of most areas is based chiefly upon either agriculture or manufacture. At one time in the United States, agriculture was by far the most important industry, but the relative economic importance of agriculture has declined. Net income in agriculture remains relatively static in the face of increased production and improved techniques; and larger investments in agricultural plant and equipment have decreased rather than increased employment. On the other hand, increased industrialization (increase in manufacturing) has become the basis for increased employment and prosperity. Manufacturing provides an initial economic activity and thus becomes the basis for secondary activities and businesses that locate where they can market their goods and services. It logically follows that an increase in value added by manufacture, which is a net measure of manufacturing production, should be an excellent index of state economic growth.

Change in capital expenditures by manufacturers for new plant and equipment. In order to raise per capita income, productivity per laborer must be increased. Productivity per laborer can be increased through improved management techniques, advanced technology, economies of scale, improvement in labor force capability, and real capital accumulation (exemplified by expenditures of manufacturers for new plant and equipment). The importance of the expenditure for new plant and equipment involves more than its monetary value; it serves as an index of the general attitude of the manufacturing and business community. A relatively small outlay for new plant and equipment may indicate a generally pessimistic attitude on the part of the business community concerning the future marginal efficiency of capital. On the other hand, larger capital expenditures usually indicate that the businessmen are confident that the given state and community face continued prosperity. Such confident expenditures may then become a basis for increased economic activity and thus serve not only as an index of current growth but also as an anchor for continued expansion. For these reasons we selected change in capital expenditures by manufacturers for new plant and equipment as the third dependent variable group.

Because of the relative inexactness of the available raw data, change in capital expenditures by manufacturers for new plant and equipment is the least dependable of the three growth index groups employed in this study. Data in some cases are withheld to avoid disclosing figures for individual companies; in other cases estimates are of limited reliability; in other words, standard errors of estimate are relatively high.

Computing the Growth Index Values

With minor exceptions, data which represent the "basic" variables were obtained from United States Bureau of the Census documents. These "basic" data were transferred to IBM cards and subsequently employed in the University of Montana IBM 1620 computer to calculate the growth index values (dependent variables) and the tax burden indexes (independent variables).[2]

An averaging technique, which is employed in the computation of the growth indexes, partially eliminates the possibility that unusual circumstances in any particular year in any state will skew the results, thus making them less comparable with values computed for other states.

Computing the first index group values.[3] First, annual personal income at the beginning of each period is compared with annual personal income at the end of each period to determine the change in each state. The amount of change is computed for each of the two periods on a total, percentage, and per capita basis.

In the first period the change in total personal income is calculated by subtracting the average total personal income for 1946-47-48 from the average total personal income for 1953-54-55. Change in total personal income for the second period is found by subtracting the average total personal income for 1953-54-55 from the average total personal

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[2]See pp. 150-157 for the formulas employed and a description of the "basic" variables, state subscript designators, and year subscript designators.

[3]See Tables 2, 3, and 4, pp. 60-64, for the computed values of Y_1 through Y_6.

income for 1961-62-63.

The change in per capita personal income for the first period is calculated by subtracting the average per capita personal income for 1946-47-48 from the average per capita personal income for 1953-54-55, and in the second period by subtracting the average per capita personal income for 1953-54-55 from the average per capita personal income for 1961-62-63.

The percentage change in personal income for the first period is calculated by dividing the 1946-47-48 average into the difference between the 1946-47-48 average and the 1953-54-55 average. The percentage change for the second period is calculated by dividing the 1953-54-55 average into the difference between the 1953-54-55 average and the 1961-62-63 average.

Computing the second index group values.[4] Secondly, change in value added by manufacture on a total, per capita, and percentage basis is computed for each state for each of the two periods.[5]

The change in total value added by manufacture for the first period is calculated by subtracting the average total value added by manufacture for 1947 and 1949 from the average total value added by

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[4]Prior to 1956 the value added by manufacture as given in either the Annual Survey of Manufacturers or the Census of Manufacturers is an unadjusted value as defined on p. 146 of this inquiry. Beginning in 1956, this value is adjusted. The 1956 Annual Survey of Manufacturers gives both adjusted and unadjusted values for that year. A comparison of the two shows unadjusted value to be approximately 96.25 percent of adjusted value. Therefore, prior to 1956 unadjusted values are divided by .9625 to obtain the desired adjusted values.

[5]See Tables 5, 6, and 7, pp. 64-68, for the computed values of Y_7 through Y_{12}.

manufacture for 1953-54-55, and for the second period by subtracting the average total value added by manufacture for 1953-54-55 from the average total value added by manufacture for 1961-62.

The techniques for calculating per capita and percentage changes in value added by manufacture are the same as those used to determine these values for the first dependent variable group. We employ the data for the years indicated in the above paragraph.

Computing the third index group values.[6] Thirdly, change in capital expenditures for new plant and equipment by manufacturers in each state is compiled for each of the two periods on a total, percentage, and per capita basis. However, new capital expenditures by manufacturers reported for 1951 and later dates are not directly comparable to values reported before that date.[7] Accordingly, the use of this growth indicator begins, for the purpose of this study, in 1951. All calculations take this into account.

The change in total capital expenditures by manufacturers for new plant and equipment for the first period is computed by subtracting the average total new capital expenditures for 1951-52 from the average total new capital expenditures for 1954-55, and in the second period by

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[6]See Tables 8, 9, and 10, pp. 69-73, for the computed values of Y_{13} through Y_{18}.

[7]In the 1947 Census and the 1949 and 1950 Annual Survey, data on capital expenditures related only to manufacturing establishments that were in operation at some time during the report year. They did not include expenditures incurred during the year for constructing and equipping new plants not yet in operation, or for renovating idle establishments. To close this statistical gap, such supplemental capital expenditures data for plant under construction were obtained in the 1951 Annual Survey and in each succeeding annual survey of manufactures and census.

subtracting the average total new capital expenditures for 1954-55 from the average total new capital expenditures for 1961-62.

The data used to calculate per capita and percentage changes in capital expenditures by manufacturers for new plant and equipment are for the years indicated in the paragraph above. We refer the reader to page 48 of this study for techniques employed to calculate these two sets of variables.

The Independent Variables

The collection of any tax, including state and local taxes, whether or not there is a resulting equivalent expenditure by the government, may alter economic behavior. Taxes may increase or curtail consumption, cause the populace to save more or consume more, affect work incentives, alter the level and type of employment, alter the method of financing real investment, and affect the type and quantities of goods and services produced. (Pertinent definitions can be found on pages 145-149 of this study.)

However, the most important and overriding economic effects of taxes are those which bear upon the allocation of resources. Taxation can alter the allocation of resources through its effect upon production, or demand, or both. Business taxes, if not shifted, may affect the allocation of resources through cost. Consequently, either total output or production patterns, or both, undergoes a change. Individual or consumer taxes, if not shifted, may affect the allocation of resources through a reduction in purchasing power and a change in consumption patterns. In either case, whether or not shifting occurs, the collection

of tax revenues, with or without accompanying governmental expenditures, probably will result in the re-allocation of some resources. Therefore, the basis of any argument concerning the effects of state and local taxation upon economic activity and economic growth must center upon the effect of this taxation upon the allocation of resources as reflected through the demand and supply of goods and services.

Accordingly, the independent variables employed in this inquiry should ideally take two forms: 1) those taxes actually borne by the consumer and the individual, and 2) those taxes actually borne by the producer or businessman. However, it is currently impossible to separate those taxes actually borne by the consumer and individual from those actually borne by the producer or businessman. A second solution pertaining to the selection of independent variables would involve a division which separates those taxes meant to be borne by the consumer and the individual from those meant to be borne by the businessman. Taxes meant to be borne by the individual and the consumer include collections derived from general sales taxes, the consumer's portion of motor vehicle license taxes and motor fuel taxes, the individual's portion of general property taxes, alcoholic beverage and tobacco product taxes, the individual income tax, and various other taxes and licenses. Taxes meant to be borne by business include collections derived from corporate income taxes, franchise taxes, use taxes, the business portion of motor fuel and motor vehicle license taxes, occupation taxes, severance taxes, depletion taxes, the business portion of general property taxes, and other miscellaneous taxes. Data, in the most valuable form,would differentiate between total state and local taxes collected from business

and total state and local taxes collected from individuals and consumers. A tax-by-tax breakdown would also be helpful. However, total (composite) state and local tax collection data are available only on an aggregated basis and a general property basis; in other words, taxes collected from individuals and consumers are not segregated from taxes collected from businessmen. Data concerning discrete business tax collections are restricted to taxes imposed by the individual state governments and are limited to state corporate income taxes, license revenues collected from corporations in general, license revenues collected from occupations and business not elsewhere classified, and minor miscellaneous taxes.

Because of these limitations in the availability of data concerning tax revenues the independent variables for this inquiry are divided into two primary groups based on 1) the burden of state and local taxes on the entire populace, and 2) the burden of certain state business taxes. In addition, a secondary group of variables comprises indexes which represent the burden of specific state tax collections and the burden represented by the very existence of particular state taxes. In order to afford an analysis of reasonable breadth it was decided to formulate 26 independent variables within the broad groups of presumed "determinants" of state economic growth.

Description of the Specific Independent Variables[8]

X_1 Total state and local taxes for each state for 1953.[9]

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[8]Values of independent variables may be found in Tables 11-21, pp. 74-91.

[9]If the reader wonders why the statistics presented use the year 1953 for the first period, it is because state-by-state estimates of

X_2 Total state and local taxes for each state for 1953 plus 1958.[10]

X_3 Total state and local taxes for 1953 as a percent of total personal income for 1953, by states.

X_4 Total state and local taxes for 1953 as a percent of total personal income for 1953, plus total state and local taxes for 1958 as a percent of total personal income for 1958, by states.

X_5 Per capita state and local taxes for each state for 1953.

X_6 Per capita state and local taxes for 1953, plus per capita state and local taxes for 1958, by states.

X_7 Total state and local taxes for 1953 as a percent of total personal income for 1953 divided by per capita personal income for 1953, by states.

X_8 Total state and local taxes for 1953 as a percent of total personal income for 1953 divided by per capital personal income for 1953, plus total state and local taxes for 1958 as a percent of total personal income for 1958 divided by per capita personal income for 1958, by states.

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total state and local revenues could be found only for 1953. We have assumed that interstate tax differentials remained relatively constant over the years of the first period and thus the analysis remains relatively accurate.

[10]The first year in the seccnd paeriod for which total state and local tax data are available is 1958. These data were combined with the 1953 data to determine the total state and local tax burden index used in the second period.

X_9 Total state business taxes for each state for years 1947 through 1954.[11]

X_{10} Total state business taxes for each state for years 1954 through 1962.

X_{11} Total state business taxes for years 1951 through 1954 as a percent of capital expenditures by manufacturers for new plant and equipment for years 1951 through 1954, by states.

X_{12} Total state business taxes for years 1954 through 1962 as a percent of capital expenditures by manufacturers for new plant and equipment for years 1954 through 1962, by states.

X_{13} Total state business taxes for years 1947 plus 1949 through 1954 as a percent of value added by manufacture for years 1947 plus 1949 through 1954, by states.

X_{14} Total state business taxes for years 1954 through 1962 as a percent of value added by manufacture for years 1954 through 1962, by states.

X_{15} Total state and local property taxes for 1953 as a percent of total personal income for 1953, by states.

X_{16} Total state and local property taxes for 1953 as a percent of total personal income for 1953, plus total state and local property taxes for 1958 as a percent of total personal income for 1958, by states.

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[11]State business taxes for the purpose of this study include state corporate income taxes, license revenues collected from corporations in general, and license revenues collected from occupations and business not elsewhere classified.

X_{17} Total state general sales taxes for years 1947 through 1954 as a percent of total personal income for years 1947 through 1954, by states.

X_{18} Total state general sales taxes for years 1954 through 1962 as a percent of total personal income for years 1954 through 1962, by states.

X_{19} Total state personal income taxes for years 1947 through 1954 as a percent of total personal income for years 1947 through 1954, by states.

X_{20} Total state personal income taxes for years 1954 through 1962 as a percent of total personal income for years 1954 through 1962, by states.

X_{21} Existence or nonexistence of a state personal income tax in 1947, by states.

X_{22} Existence or nonexistence of a state personal income tax in 1955, by states.

X_{23} Existence or nonexistence of a state general sales tax in 1947, by states.

X_{24} Existence or nonexistence of a state general sales tax in 1955, by states.

X_{25} Existence or nonexistence of a state corporate income tax in 1947, by states.

X_{26} Existence or nonexistence of a state corporate income tax in 1955, by states.

Special Considerations Involved in the Selection of the Tax Burden Indexes

Total state and local tax collections (X_1 and X_2). Total tax collections in one state may be fairly compared to total tax collections in another state only if the two states are reasonably alike in population and income. Since there are always both population and income differences between states, a simple total of a given state's collections would not be an accurate indication of the burden of taxation upon industry and individuals, nor would it be a fair basis for comparison with other states. Therefore, it is necessary to reduce total tax collections to some common denominator such as population, before they afford a reasonably precise measure of the tax burden, and before a state-by-state comparison makes sense. However, when we use total state and local tax collections as the numerator of a tax burden-growth ratio, and some state growth variable as the denominator, the result can be meaningful. One can also make a meaningful correlation computation involving a total state and local tax variable and a total state growth variable. It is only when the tax burden stands in isolation that the absolute value has limited meaning.

Total state and local tax collections as a percent of total personal income (X_3 and X_4). This is the most conventional form used to represent the tax burden--although it is subject to criticism. Economist Henry J. Frank of Princeton University states: "Taxes as a percent of income do not indicate the efforts of a society to produce a given quantity of income. For instance, in a society where ten persons can

produce the same amount as in another where fifteen persons are necessary, the payment of a tenth of total production is less of a burden than on the members of the poorer society."[12] However, because of its wide acceptance and relative reliability as a tax burden index, total state and local tax collections as a percent of the total personal income becomes the independent variable most used in this inquiry.

State and local tax collections per capita (X_5 and X_6). Per capita state and local taxes are derived by dividing total taxes by the resident population. This measurement of the tax burden is widely used despite the fact that 1) each resident is assigned a value of one, regardless of sex, age, or ability to pay, and 2) all states vary in the quantity of non-residents who pay taxes.

Total state and local tax collections as a percent of total personal income divided by per capita personal income (X_7 and X_8). Taxes as a percent of total personal income do not measure each individual's degree of sacrifice; nor do per capita taxes measure the ability to pay. These defects are partially remedied through a suggestion by the above quoted Henry J. Frank: "In order to measure the degree of sacrifice involved in each state, on the average, for the payment of state and local taxes, taxes as a percent of personal income are divided by per capita personal income. The underlying assumption is that in two states with identical taxes per dollar of income, the resident of the state

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[12]Henry J. Frank, "Measuring State Tax Burdens," National Tax Journal, 12(2):182, June, 1959.

where per capita personal income is greater, will have to make less of a sacrifice in order to pay."[13]

Total state business tax collections (X_9 and X_{10}). The discussion concerning X_1 and X_2 is pertinent to these variables and does not need repeating here.

Total state business tax collections as a percent of capital expenditures by manufacturers for new plant and equipment (X_{11} and X_{12}). In order to deflate absolute tax collection values, it is necessary to divide them by suitable common denominators. It is presumed that the capital expenditures made by manufacturers for new plant and equipment are acceptable as common denominators because these expenditures serve as an overall measurement of present and potential ability by businessmen to pay state business taxes.

Total state business tax collections as a percent of total value added by manufacture (X_{13} and X_{14}). Since total value added by manufacture is closely related to total manufacturing net income, it can serve as a reliable index of the overall ability of businessmen to pay state business taxes--and therefore becomes a means for deflating absolute state tax collections.

Tax collections from specific taxes--and the burden resulting from the very existence of these taxes (X_{15} through X_{26}). One often hears the argument that it is not the volume of taxes collected that

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[13]Ibid., p. 182.

most significantly affects state economic activity. It is alleged that tax collections from a particular tax are often much more detrimental to economic growth than are equal collections from other taxes. The argument continues that the very existence of a given tax may adversely affect growth. To test these contentions the author formulated 1) independent variables which represent the burdens resulting from the collection of various taxes, and 2) independent variables which represent the burdens resulting from the very existence of particular taxes.

This chapter has expressed the scope and objective of the inquiry, has formulated the dependent and independent variables and has exposed the reader to the general hypothesis. In the following chapter we will state and examine certain specific functional relationships--a process which is intended to shed some light on the controversy concerning the relationship between state economic growth and the state and local tax burden.

TABLE 2. Total change in personal income, by states, 1947-1954 and 1954-1962.

States	Y_1 (10^6) 1947-1954	Y_2 (10^6) 1954-1962
Alabama	$ 1,104.3	$ 1,794.0
Arizona	782.6	1,630.0
Arkansas	349.3	951.6
California	11,869.3	21,146.0
Colorado	1,023.6	1,946.3
Connecticut	2,136.3	2,740.0
Delaware	458.0	536.3
Florida	2,882.3	5,661.6
Georgia	1,786.3	2,542.3
Idaho	214.3	437.0
Illinois	6,580.0	8,658.3
Indiana	3,111.6	3,025.3
Iowa	987.0	1,833.0
Kansas	1,079.6	1,463.3
Kentucky	486.3	1,517.3
Louisiana	1,527.6	1,888.0
Maine	355.6	544.0
Maryland	2,254.3	3,385.6
Massachusetts	3,001.6	4,631.3
Michigan	6,402.0	4,532.6
Minnesota	1,676.6	2,594.6
Mississippi	534.0	1,002.3
Missouri	2,489.6	3,119.6
Montana	303.3	383.3
Nebraska	546.0	1,074.6
Nevada	262.0	566.6
New Hampshire	288.6	490.6
New Jersey	5,232.6	6,087.3
New Mexico	529.3	764.0
New York	9,525.6	16,298.0
North Carolina	1,880.6	2,968.6
North Dakota	- 3.3	465.0
Ohio	6,779.6	6,394.0
Oklahoma	1,097.6	1,434.6
Oregon	1,026.3	1,360.3
Pennsylvania	6,268.0	6,824.6
Rhode Island	466.3	489.0
South Carolina	961.6	1,212.6
South Dakota	66.0	515.6
Tennessee	1,369.0	2,040.6
Texas	5,664.0	6,803.6
Utah	403.6	814.0

Table 2. (Continued)

States	Y_1 (10^6) 1947-1954	Y_2 (10^6) 1954-1962
Vermont	$ 127.6	$ 243.0
Virginia	2,333.0	2,989.0
Washington	1,655.6	2,329.3
West Virginia	- 394.0	693.6
Wisconsin	2,028.0	2,943.6
Wyoming	164.3	251.0

Sources: Y_1 U. S. Bureau of the Census, Statistical Abstract of the United States, 1949, p. 284; 1950, p. 266; 1953, p. 299; 1955, p. 311.

Y_2 Ibid., 1953, p. 299; 1955, p. 311; 1964, p. 329; and U. S. Department of Commerce, Office of Business Economics, Survey of Current Business, 1964, Vol. 44, No. 8, August, p. 16.

TABLE 3. Per capita change in personal income, by states, 1947-1954 and 1954-1962.

States	Y_3 1947-1954	Y_4 1954-1962
Alabama	$333.68	$434.91
Arizona	487.00	496.84
Arkansas	237.49	475.54
California	564.18	678.51
Colorado	442.09	650.34
Connecticut	775.42	687.92
Delaware	928.32	631.85
Florida	514.64	470.07
Georgia	402.68	470.76
Idaho	206.79	424.08
Illinois	548.16	665.71
Indiana	589.27	477.99
Iowa	314.87	588.08
Kansas	430.02	531.53
Kentucky	115.70	427.09
Louisiana	425.37	377.13
Maine	329.04	447.90

Table 3. (Continued)

States	Y_3 1947-1954	Y_4 1954-1962
Maryland	640.13	703.45
Massachusetts	529.45	779.74
Michigan	710.67	305.45
Minnesota	422.80	579.06
Mississippi	252.14	375.81
Missouri	533.38	624.23
Montana	225.19	353.61
Nebraska	321.65	640.55
Nevada	652.57	723.70
New Hampshire	438.54	614.82
New Jersey	788.38	608.50
New Mexico	427.97	438.09
New York	417.74	717.85
North Carolina	359.17	494.31
North Dakota	-119.40	694.65
Ohio	595.89	383.77
Oklahoma	468.11	453.86
Oregon	425.14	584.08
Pennsylvania	511.58	499.75
Rhode Island	469.04	452.56
South Carolina	348.02	383.26
South Dakota	- 53.99	607.77
Tennessee	339.55	462.27
Texas	509.99	412.92
Utah	332.86	528.57
Vermont	262.88	586.22
Virginia	533.39	469.29
Washington	477.11	466.43
West Virginia	-247.04	482.83
Wisconsin	421.96	546.48
Wyoming	362.50	538.05

Sources: Y_3 Personal income sources: U. S. Bureau of the Census, Statistical Abstract of the United States, 1949, p. 284; 1950, p. 266; 1953, p. 299; 1955, p. 311. Population sources: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 72, p. 3; No. 304, p. 10.

Y_4 Personal income sources: Statistical Abstract, 1953, p. 299; 1955, p. 311; 1964, p.329; and U.S.D.C., Office of Business Economics, Survey of Current Business, 1964, Vol. 44, No. 8, August, p. 16. Population sources: Current Population Reports, Series P-25, No. 304, p. 10; and Statistical Abstract, 1964, p. 11.

TABLE 4. Percentage change in personal income, by states, 1947-1954 and 1954-1962.

States	Y_5 1947-1954	Y_6 1954-1962
Alabama	46.9	51.9
Arizona	107.6	107.9
Arkansas	23.6	52.0
California	73.8	75.6
Colorado	64.5	74.6
Connecticut	67.8	51.8
Delaware	96.4	57.5
Florida	111.0	103.3
Georgia	62.7	54.8
Idaho	32.0	49.4
Illinois	48.5	43.0
Indiana	63.2	37.6
Iowa	30.0	42.9
Kansas	46.8	43.2
Kentucky	14.8	40.3
Louisiana	66.4	49.3
Maine	35.2	39.8
Maryland	77.3	65.5
Massachusetts	45.3	48.1
Michigan	76.0	30.5
Minnesota	47.6	49.9
Mississippi	38.0	51.7
Missouri	52.3	43.0
Montana	37.8	34.7
Nebraska	33.0	48.8
Nevada	102.2	109.3
New Hampshire	47.6	54.8
New Jersey	78.4	51.1
New Mexico	92.9	69.5
New York	37.8	46.9
North Carolina	57.1	57.3
North Dakota	- .4	58.9
Ohio	61.8	36.0
Oklahoma	51.4	44.4
Oregon	52.6	45.7
Pennsylvania	45.2	33.9
Rhode Island	42.6	31.3
South Carolina	61.9	48.2
South Dakota	8.1	58.9
Tennessee	48.9	49.0
Texas	71.3	50.0
Utah	52.9	69.8

Table 4. (Continued)

State	Y_5 1947-1954	Y_6 1954-1962
Vermont	30.7	44.7
Virginia	76.6	55.5
Washington	49.4	46.5
West Virginia	-13.4	27.3
Wisconsin	47.1	46.4
Wyoming	42.9	45.9

Sources: Y_5 U. S. Bureau of the Census, Statistical Abstract of the United States, 1949, p. 284; 1950, p. 266; 1953, p. 299; 1955, p. 311.

Y_6 Ibid., 1953, p. 299; 1955, p. 311; 1964, p. 329; and U. S. Department of Commerce, Office of Business Economics, Survey of Current Business, 1964, Vol. 44, No. 8, August, p. 16.

TABLE 5. Total change in value added by manufacture, by states, 1947-1954 and 1954-1962.

States	Y_7 (10^6) 1947-1954	Y_8 (10^6) 1954-1962
Alabama	$ 541.1	$ 576.8
Arizona	125.3	261.1
Arkansas	246.0	344.5
California	4,887.8	5,958.1
Colorado	224.8	549.6
Connecticut	1,307.3	886.6
Delaware	184.6	104.3
Florida	502.8	1,126.1
Georgia	709.0	904.5
Idaho	84.6	99.8
Illinois	3,397.0	2,763.5
Indiana	2,130.3	1,445.6
Iowa	555.0	653.0
Kansas	603.5	215.0
Kentucky	580.3	715.6
Louisiana	571.6	317.3
Maine	168.6	132.8

Table 5. (Continued)

States	Y_7 (10^6) 1947-1954	Y_8 (10^6) 1954-1962
Maryland	$ 793.6	$ 759.3
Massachusetts	1,291.3	1,675.1
Michigan	4,409.1	980.3
Minnesota	607.5	856.5
Mississippi	239.5	293.0
Missouri	1,214.0	1,014.0
Montana	79.5	53.5
Nebraska	179.3	247.1
Nevada	49.1	17.3
New Hampshire	128.8	150.1
New Jersey	2,451.6	2,327.3
New Mexico	74.1	- 3.1
New York	5,018.1	3,592.8
North Carolina	740.0	1,628.5
North Dakota[1]	12.3	20.6
Ohio	4,823.6	2,482.8
Oklahoma	282.8	202.1
Oregon	419.1	318.3
Pennsylvania	4,136.8	1,396.1
Rhode Island	149.0	211.0
South Carolina	383.3	687.1
South Dakota[1]	26.3	46.6
Tennessee	854.0	1,016.0
Texas	2,019.8	2,320.1
Utah	185.6	331.3
Vermont	86.8	62.1
Virginia	651.3	922.6
Washington	724.5	987.5
West Virginia	390.5	390.5
Wisconsin	1,278.0	1,156.0
Wyoming	20.5	20.0

[1]Value added by manufacture data for 1949, 1950, and 1951 is interpolated. The 1950 and 1951 value added by manufacture data is not employed in the computation of either X_7 or X_8 but is employed in the computation of X_{13}.

Sources: Y_7 U. S. Bureau of the Census, Statistical Abstract of the United States, 1955, pp. 816-17; 1952, p. 782; 1959, pp. 788-89.

Y_8 Ibid., 1955, pp. 816-17; 1959, pp. 788-89; 1963, pp. 782-83; 1964, pp. 778-79.

TABLE 6. Per capita change in value added by manufacture, 1947-1954 and 1954-1962, by states.

States	Y_9 1947-1954	Y_{10} 1954-1962
Alabama	$ 173.03	$ 131.85
Arizona	92.72	92.81
Arkansas	146.90	178.14
California	299.40	181.72
Colorado	114.42	225.05
Connecticut	495.90	136.44
Delaware	387.13	11.71
Florida	106.87	124.71
Georgia	169.86	169.03
Idaho	120.34	103.92
Illinois	301.51	178.46
Indiana	423.33	200.47
Iowa	196.44	213.34
Kansas	276.42	56.99
Kentucky	189.24	209.68
Louisiana	168.54	35.93
Maine	165.95	87.69
Maryland	230.40	110.44
Massachusetts	261.88	386.73
Michigan	671.81	221.49
Minnesota	163.44	194.96
Mississippi	115.04	114.36
Missouri	272.11	195.26
Montana	106.58	48.53
Nebraska	121.50	153.35
Nevada	181.32	- 69.99
New Hampshire	198.30	159.76
New Jersey	356.60	180.77
New Mexico	77.22	- 40.58
New York	259.67	119.96
North Carolina	139.24	286.70
North Dakota[1]	17.37	30.39
Ohio	458.66	92.57
Oklahoma	120.19	60.56
Oregon	184.15	118.95
Pennsylvania	351.53	68.22
Rhode Island	143.63	195.84
South Carolina	138.32	233.73
South Dakota[1]	33.74	56.63
Tennessee	237.98	240.21
Texas	209.43	162.22
Utah	213.09	265.75

Table 6. (Continued)

States	Y_9 1947-1954	Y_{10} 1954-1962
Vermont	$ 211.71	$ 144.61
Virginia	151.24	148.33
Washington	239.22	233.46
West Virginia	199.23	256.19
Wisconsin	298.96	184.83
Wyoming	55.82	39.13

[1]See Table 5, Footnote 1.

Sources: Y_9 Value added sources: U. S. Bureau of the Census, Statistical Abstract of the United States, 1955, pp. 816-17; 1952, p. 782; 1959, pp. 788-89. Population sources: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 72, p. 3; No. 304, p. 10.

Y_{10} Value added sources: Statistical Abstract, 1955, pp. 816-17; 1959, pp. 788-89; 1963, pp. 782-83; 1964, pp. 778-79. Population sources: Current Population Reports, No. 304, p. 10; Statistical Abstract, 1964, p. 11.

TABLE 7. Percentage change in value added by manufacture, by states, 1947-1954 and 1954-1962.

States	Y_{11} 1947-1954	Y_{12} 1954-1962
Alabama	60.7	40.2
Arizona	122.8	114.8
Arkansas	93.5	67.6
California	115.2	65.2
Colorado	76.6	106.0
Connecticut	70.4	28.0
Delaware	86.2	26.1
Florida	135.3	128.8
Georgia	67.6	51.4
Idaho	80.6	52.6
Illinois	48.1	26.4
Indiana	67.9	27.4
Iowa	72.8	49.5
Kansas	121.0	19.5
Kentucky	72.5	51.8

Table 7. (Continued)

States	Y_{11} 1947-1954	Y_{12} 1954-1962
Louisiana	78.2	24.3
Maine	38.6	21.9
Maryland	65.2	37.7
Massachusetts	37.8	35.6
Michigan	77.4	9.7
Minnesota	55.5	50.3
Mississippi	88.2	57.3
Missouri	69.6	34.3
Montana	87.8	31.4
Nebraska	71.7	57.5
Nevada	200.6	23.5
New Hampshire	40.1	33.4
New Jersey	56.2	34.1
New Mexico	133.6	- 2.4
New York	50.3	23.9
North Carolina	43.5	66.7
North Dakota[1]	41.1	48.8
Ohio	72.7	21.6
Oklahoma	84.8	32.8
Oregon	61.6	28.9
Pennsylvania	57.3	12.2
Rhode Island	23.4	26.9
South Carolina	48.7	58.7
South Dakota[1]	45.4	55.3
Tennessee	84.8	54.5
Texas	109.8	60.1
Utah	134.5	102.3
Vermont	55.4	25.5
Virginia	58.6	52.3
Washington	77.4	59.4
West Virginia	54.3	35.2
Wisconsin	53.2	31.4
Wyoming	61.1	37.0

[1]See Table 5, Footnote 1.

Sources: Y_{11} U. S. Bureau of the Census, Statistical Abstract of the United States, 1955, pp. 816-17; 1952, p. 782; 1959, pp. 788-89.

Y_{12} Ibid., 1955, pp. 816-17; 1959, pp. 788-89; 1963, pp. 782-83; 1964, pp. 778-79.

TABLE 8. Total change in capital expenditures by manufacturers for new plant and equipment, 1951-1954 and 1954-1962, by states.

States	Y_{13} (10^6) 1951-1954	Y_{14} (10^6) 1954-1962
Alabama	$ - 11.5	$ - 59.5
Arizona	5.0	21.5
Arkansas	1.5	25.0
California	112.5	238.0
Colorado	- .5	39.0
Connecticut	- 9.0	57.5
Delaware	- 9.5	35.0
Florida	11.0	115.0
Georgia	75.0	- 15.0
Idaho	5.0	1.0
Illinois	5.0	167.0
Indiana	6.5	41.5
Iowa	2.5	40.0
Kansas	- 6.0	6.0
Kentucky	16.0	7.0
Louisiana	- 51.5	23.0
Maine	19.5	- 5.0
Maryland	37.5	74.0
Massachusetts	11.0	94.0
Michigan	254.0	-292.5
Minnesota	22.0	56.5
Mississippi	- .5	39.0
Missouri	12.0	54.5
Montana[1]	32.0	- 22.5
Nebraska	9.0	12.5
Nevada[2]	2.0	0.0
New Hampshire	- 2.5	10.5
New Jersey	44.5	118.5
New Mexico	5.5	- .5
New York	18.5	155.0
North Carolina	- 2.5	109.5
North Dakota[3]	6.5	- 11.5
Ohio	- 42.0	28.5
Oklahoma	10.5	- 3.0
Oregon	21.5	37.0
Pennsylvania	-228.0	105.5
Rhode Island	- 6.0	17.0
South Carolina	- 39.5	89.0
South Dakota	- .5	10.0
Tennessee	26.0	55.0
Texas	-130.0	186.5
Utah	8.5	8.5
Vermont[1]	- 3.5	10.0

Table 8. (Continued)

States	Y_{13} (10^6) 1951-1954	Y_{14} (10^6) 1954-1962
Virginia	$ 23.5	$ 49.0
Washington	50.5	- 10.0
West Virginia	13.5	24.0
Wisconsin	- 17.5	70.5
Wyoming	- 7.5	1.0

[1]Capital expenditures by manufacturers for new plant and equipment data for 1951 are interpolated.

[2]Capital expenditures by manufacturers for new plant and equipment data for 1952 are interpolated.

[3]Capital expenditures by manufacturers for new plant and equipment data for 1951 and 1952 are interpolated.

Sources: Y_{13} U. S. Bureau of the Census, Annual Survey of Manufactures, 1951, pp. 118-19; 1952, pp. 106-07; U. S. Bureau of the Census, Census of Manufactures, 1958, Vol. I, Summary Statistics, pp. 5-14 and 5-15.

Y_{14} Ibid., pp. 5-14 and 5-15; Annual Survey of Manufactures, 1962, pp. 18-26.

TABLE 9. Per capita change in capital expenditures by manufacturers for new plant and equipment, 1951-1954 and 1954-1962, by states.

States	Y_{15} 1951-1954	Y_{16} 1954-1962
Alabama	$ - 3.95	$ 15.37
Arizona	3.39	9.43
Arkansas	2.96	12.27
California	3.62	3.85
Colorado	- 3.17	16.90
Connecticut	- 12.08	14.55
Delaware	- 35.24	64.60
Florida	- 1.30	13.38
Georgia	20.16	- 9.16
Idaho	6.58	- 3.48
Illinois	- 2.64	12.02
Indiana	- 2.63	2.22

Table 9. (Continued)

States	Y_{15} 1951-1954	Y_{16} 1954-1962
Iowa	$ .70	$ 13.06
Kansas	- 4.66	.95
Kentucky	6.10	- .06
Louisiana	- 19.89	.91
Maine	18.97	- 8.32
Maryland	10.03	15.82
Massachusetts	4.52	20.17
Michigan	48.51	- 40.81
Minnesota	6.26	13.93
Mississippi	.76	15.92
Missouri	2.30	10.93
Montana[1]	49.45	- 38.55
Nebraska	6.37	7.40
Nevada[2]	5.43	- 7.40
New Hampshire	- 6.62	13.60
New Jersey	3.61	9.29
New Mexico	6.72	- 3.41
New York	- .63	5.93
North Carolina	- 1.09	19.60
North Dakota[3]	10.60	- 18.99
Ohio	- 13.23	- 5.66
Oklahoma	5.00	- 2.97
Oregon	- 15.40	16.91
Pennsylvania	- 25.47	6.67
Rhode Island	- 8.19	17.55
South Carolina	- 17.71	33.28
South Dakota	- .77	13.69
Tennessee	7.33	12.39
Texas	- 17.20	10.98
Utah	9.07	1.70
Vermont[1]	- 9.34	25.11
Virginia	5.84	6.36
Washington	17.49	- 12.82
West Virginia	10.05	16.39
Wisconsin	- 7.74	13.33
Wyoming	- 26.11	.68

[1]See Table 8, Footnote 1.

[2]See Table 8, Footnote 2.

[3]See Table 8, Footnote 3.

Sources: Y_{15} New capital expenditures: U. S. Bureau of the Census, Annual

Table 9. (Continued)

Survey of Manufactures, 1951, pp. 118-19; 1952, pp. 106-07; U. S. Bureau of the Census, Census of Manufactures, 1958, Vol. I, Summary Statistics, pp. 5-14 and 5-15. Population sources: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 72, p. 3; No. 304, p. 10

Y_{16} New capital expenditures: Summary Statistics, pp. 5-14 and 5-15; Annual Survey of Manufactures, 1962, pp. 18-26. Population sources: Current Population Reports, No. 304, p. 10; Statistical Abstract, 1964, p. 11.

TABLE 10. Percentage change in capital expenditures by manufacturers for new plant and equipment, 1951-1954 and 1954-1962, by states.

States	Y_{17} 1947-1954	Y_{18} 1954-1962
Alabama	- 11.5	67.2
Arizona	50.0	143.3
Arkansas	- 3.2	52.0
California	23.6	40.4
Colorado	- 1.5	121.8
Connecticut	- 6.0	41.0
Delaware	- 29.2	152.1
Florida	13.4	124.8
Georgia	68.4	- 8.1
Idaho	24.3	- 3.9
Illinois	.8	29.3
Indiana	1.7	11.0
Iowa	3.3	51.9
Kansas	- 9.2	10.1
Kentucky	14.8	- 5.6
Louisiana	- 27.8	17.2
Maine	52.7	- 8.8
Maryland	38.0	54.4
Massachusetts	6.2	50.0
Michigan	42.4	34.3
Minnesota	36.0	68.0
Mississippi	- 1.4	111.4
Missouri	9.8	40.6
Montana[1]	290.9	- 52.3
Nebraska	46.1	43.8
Nevada[2]	66.6	0.0
New Hampshire	- 11.3	53.8
New Jersey	13.2	31.0

Table 10. (Continued)

States	Y_{17} 1947-1954	Y_{18} 1954-1962
New Mexico	110.0	- 4.7
New York	3.3	27.4
North Carolina	- 1.6	72.5
North Dakota[3]	76.4	- 76.6
Ohio	- 5.4	3.8
Oklahoma	27.6	- 6.1
Oregon	22.3	49.6
Pennsylvania	- 25.9	16.2
Rhode Island	- 16.9	57.6
South Carolina	- 35.1	121.9
South Dakota	- 14.2	333.3
Tennessee	23.1	39.7
Texas	- 23.1	43.2
Utah	40.4	28.8
Vermont[1]	- 26.9	105.2
Virginia	21.6	37.1
Washington	41.0	- 5.7
West Virginia	13.0	20.5
Wisconsin	- 9.2	41.1
Wyoming	- 55.5	16.6

[1]See Table 8, Footnote 1.

[2]See Table 8, Footnote 2.

[3]See Table 8, Footnote 3.

Sources: Y_{17} U. S. Bureau of the Census, Annual Survey of Manufactures, 1951, pp. 118-19; 1952, pp. 106-107; U. S. Bureau of the Census, Census of Manufactures, 1958, Vol. I, Summary Statistics, pp. 5-14 and 5-15.

Y_{18} Ibid., pp. 5-14 and 5-15; Annual Survey of Manufactures, 1962, pp. 18-26.

TABLE 11. Total state and local taxes, 1953, and 1953 plus 1958, by states.

States	X_1 (10^6) 1953	X_2 (10^6) 1953 plus 1958
Alabama	$ 230	$ 560
Arizona	121	325
Arkansas	143	342
California	2,176	5,720
Colorado	222	563
Connecticut	299	771
Delaware	36	105
Florida	441	1,203
Georgia	338	821
Idaho	81	188
Illinois	1,219	3,013
Indiana	542	1,288
Iowa	387	888
Kansas	289	692
Kentucky	232	562
Louisiana	379	897
Maine	116	274
Maryland	308	791
Massachusetts	797	1,857
Michigan	1,003	2,525
Minnesota	462	1,118
Mississippi	176	419
Missouri	419	999
Montana	82	217
Nebraska	165	379
Nevada	35	100
New Hampshire	83	175
New Jersey	729	1,796
New Mexico	89	227
New York	2,855	6,781
North Carolina	398	924
North Dakota	86	199
Ohio	975	2,463
Oklahoma	282	650
Oregon	241	597
Pennsylvania	1,205	2,904
Rhode Island	87	228
South Carolina	216	466
South Dakota	92	213
Tennessee	287	710
Texas	859	2,196
Utah	95	241

Table 11. (Continued)

States	X_1 (10^6) 1953	X_2 (10^6) 1953 plus 1958
Vermont	$ 51	$ 126
Virginia	315	778
Washington	386	930
West Virginia	173	408
Wisconsin	550	1,290
Wyoming	48	115

Sources: X_1 U. S. Bureau of the Census, State and Local Government Revenue in 1953, State and Local Government Special Studies, No. 37, pp. 10-13.

X_2 U. S. Bureau of the Census, Governmental Finances in 1958, p. 23; State and Local Government Revenue in 1953, No. 37, pp. 10-13.

TABLE 12. Total state and local taxes as a percent of total personal income, 1953, and 1953 plus 1958, by states.

States	X_3 1953	X_4 1953 plus 1958
Alabama	6.8	14.3
Arizona	8.4	17.7
Arkansas	7.9	17.2
California	8.1	17.7
Colorado	8.8	18.5
Connecticut	5.8	13.0
Delaware	4.1	9.6
Florida	8.7	17.8
Georgia	7.4	15.9
Idaho	9.2	18.7
Illinois	6.2	13.6
Indiana	6.7	14.8
Iowa	9.4	18.9
Kansas	8.8	18.3
Kentucky	6.2	13.8
Louisiana	10.1	20.6
Maine	8.8	18.4
Maryland	6.1	13.4
Massachusetts	8.5	17.6
Michigan	6.9	16.0

Table 12. (Continued)

States	X_3 1953	X_4 1953 plus 1958
Minnesota	9.2	19.3
Mississippi	9.2	19.8
Missouri	5.9	12.6
Montana	7.5	17.6
Nebraska	7.6	15.3
Nevada	7.5	16.9
New Hampshire	9.7	18.0
New Jersey	6.2	13.6
New Mexico	8.4	17.2
New York	8.5	17.8
North Carolina	8.0	16.3
North Dakota	11.5	22.2
Ohio	5.6	12.8
Oklahoma	8.9	18.2
Oregon	8.2	18.3
Pennsylvania	6.0	13.2
Rhode Island	5.6	13.8
South Carolina	8.5	17.0
South Dakota	10.5	21.2
Tennessee	7.0	15.4
Texas	6.5	14.3
Utah	8.4	18.0
Vermont	9.5	21.2
Virginia	5.9	12.9
Washington	7.9	17.0
West Virginia	6.7	14.6
Wisconsin	8.8	18.5
Wyoming	8.8	18.8

Sources: X_3 Tax: U. S. Bureau of the Census, State and Local Government Revenue in 1953, State and Local Government Special Studies, No. 37, pp. 10-13. Personal income: U. S. Bureau of the Census, Statistical Abstract of the United States, 1953, p. 299.

X_4 Tax: U. S. Bureau of the Census, Governmental Finances in 1958, p. 23; State and Local Government Revenue in 1953, No. 37, pp. 10-13. Personal income: Statistical Abstract of the United States, 1953, p. 299; 1961, p. 307.

TABLE 13. Per capita state and local taxes, 1953, and 1953 plus 1958, by states.

States	X_5 1953	X_6 1953 plus 1958
Alabama	$ 76.25	$ 180.59
Arizona	135.34	306.34
Arkansas	78.31	193.60
California	179.55	417.72
Colorado	154.48	359.04
Connecticut	140.83	333.80
Delaware	101.40	260.76
Florida	138.81	303.38
Georgia	94.83	221.80
Idaho	136.36	301.99
Illinois	134.93	316.40
Indiana	129.82	292.59
Iowa	145.32	330.33
Kansas	145.88	334.02
Kentucky	78.35	189.80
Louisiana	132.14	296.33
Maine	132.26	299.64
Maryland	121.69	283.66
Massachusetts	153.62	377.20
Michigan	124.92	365.28
Minnesota	150.34	348.34
Mississippi	81.63	198.12
Missouri	103.12	241.68
Montana	133.76	336.47
Nebraska	121.95	276.68
Nevada	179.48	421.12
New Hampshire	152.29	310.64
New Jersey	140.89	322.05
New Mexico	116.03	271.79
New York	184.20	420.69
North Carolina	94.89	215.09
North Dakota	137.16	323.62
Ohio	115.20	270.22
Oklahoma	128.18	290.51
Oregon	148.76	355.98
Pennsylvania	113.67	267.32
Rhode Island	104.19	268.52
South Carolina	95.91	204.42
South Dakota	138.97	323.42
Tennessee	86.36	208.23
Texas	102.17	246.68
Utah	126.83	299.61
Vermont	134.21	331.57

Table 13. (Continued)

States	X_5 1953	X_6 1953 plus 1958
Virginia	$ 88.23	$ 206.52
Washington	155.58	351.75
West Virginia	86.80	214.17
Wisconsin	156.42	348.98
Wyoming	163.82	376.52

Sources: X_5 Tax: U. S. Bureau of the Census, State and Local Government Revenue in 1953, State and Local Government Special Studies, No. 37, pp. 10-13. Population: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 304, p. 10.

X_6 Tax: U. S. Bureau of the Census, Governmental Finances in 1958, p. 23; State and Local Government Revenue in 1953, No. 37, pp. 10-13. Population: Current Population Reports, No. 304, p. 10.

TABLE 14. Total state and local taxes as a percent of total personal income divided by per capita personal income, 1953, and 1953 plus 1958, by states.

States	X_7 1953	X_8 1953 plus 1958
Alabama	.00606	.01151
Arizona	.00530	.01032
Arkansas	.00813	.01554
California	.00372	.00755
Colorado	.00504	.00966
Connecticut	.00239	.00512
Delaware	.00169	.00361
Florida	.00552	.01056
Georgia	.00587	.01158
Idaho	.00626	.01171
Illinois	.00286	.00588
Indiana	.00346	.00757
Iowa	.00613	.01104
Kansas	.00533	.01019
Kentucky	.00490	.01010
Louisiana	.00776	.01448

Table 14. (Continued)

States	X_7 1953	X_8 1953 plus 1958
Maine	.00587	.01140
Maryland	.00310	.00635
Massachusetts	.00474	.00843
Michigan	.00383	.00733
Minnesota	.00569	.01086
Mississippi	.01057	.02017
Missouri	.00343	.00668
Montana	.00427	.00927
Nebraska	.00477	.00865
Nevada	.00314	.00686
New Hampshire	.00626	.01063
New Jersey	.00281	.00582
New Mexico	.00609	.01116
New York	.00398	.00765
North Carolina	.00679	.01256
North Dakota	.00979	.01585
Ohio	.00274	.00613
Oklahoma	.00619	.01152
Oregon	.00462	.00953
Pennsylvania	.00317	.00654
Rhode Island	.00307	.00713
South Carolina	.00761	.01433
South Dakota	.00808	.01427
Tennessee	.00575	.01155
Texas	.00422	.00844
Utah	.00561	.01098
Vermont	.00684	.01369
Virginia	.00406	.00815
Washington	.00404	.00827
West Virginia	.00525	.01020
Wisconsin	.00503	.00989
Wyoming	.00482	.00944

Sources: X_7 Tax: U. S. Bureau of the Census, State and Local Government Revenue in 1953, State and Local Government Special Studies, No. 37, pp. 10-13. Personal income: U. S. Bureau of the Census, Statistical Abstract of the United States, 1953, p. 299. Population: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 304, p. 10.

X_8 Tax: U. S. Bureau of the Census, Governmental Finances in 1958, p. 23; State and Local Government Revenue in 1953, No. 37, pp. 10-13. Personal income: Statistical Abstract of the United States, 1953, p. 299; 1961, p. 307. Population: Current Population Reports, No. 304, p. 10.

TABLE 15. Total state business taxes, 1947 through 1954, and 1954 through 1962, by states.

States	X_9 (10^6) 1947 thru 1954	X_{10} (10^6) 1954 thru 1962
	$	$
Alabama[1]		
Arizona[2]	41.0	67.2
Arkansas	65.3	105.4
California	682.4	1,780.8
Colorado	51.7	120.8
Connecticut	146.3	289.0
Delaware	42.2	124.6
Florida	59.7	178.0
Georgia	150.2	223.5
Idaho	32.4	60.1
Illinois	50.5	106.0
Indiana	14.0	39.9
Iowa	29.2	49.3
Kansas	39.6	88.5
Kentucky	86.7	185.4
Louisiana[3]		
Maine	9.9	26.5
Maryland	100.3	204.9
Massachusetts	628.2	923.2
Michigan	199.4	531.3
Minnesota	155.9	286.5
Mississippi	81.2	157.1
Missouri[3]		
Montana	19.5	38.9
Nebraska	6.5	19.2
Nevada	2.1	6.8
New Hampshire	2.9	7.9
New Jersey	91.4	387.0
New Mexico[3]		
New York	1,348.3	2,245.7
North Carolina	372.3	601.7
North Dakota	12.0	23.4
Ohio	86.9	287.5
Oklahoma	85.2	142.3
Oregon	149.1	209.1
Pennsylvania	1,101.1	1,005.4
Rhode Island	62.6	87.3
South Carolina	134.1	185.7
South Dakota	3.8	9.4
Tennessee	156.2	339.5
Texas	91.0	411.0
Utah	24.2	55.5
Vermont	14.3	22.8

Table 15. (Continued)

States	X_9 (10^6) 1947 thru 1954	X_{10} (10^6) 1954 thru 1962
Virginia	$ 206.7	$ 384.1
Washington	16.1	55.5
West Virginia	12.6	23.4
Wisconsin	383.2	507.3
Wyoming	1.1	3.1

[1]Data are not used because for certain years state corporate income tax collections, except those for financial institutions, are included with state personal income tax collections.

[2]State corporate income tax for 1957 for Arizona is interpolated.

[3]Data are not used because for certain years state corporate and personal income tax collections are included as one figure.

Sources: X_9 U. S. Bureau of the Census, Compendium of State Government Finances in 1947, pp. 10-12; 1948, pp. 10-12; 1949, pp. 10-12; 1950, pp. 10-12; 1951, pp. 11-13; 1952, pp. 11-13; 1953, pp. 11-13; 1954, pp. 11-13.

X_{10} Ibid., 1954, pp. 11-13; 1955, pp. 11-13; 1956, pp. 11-13; 1957, pp. 11-13; 1958, pp. 11-13; 1959, pp. 11-13; 1960, pp. 13-15; 1961, pp. 11-13; 1962, pp. 11-13.

TABLE 16. Total state business taxes as a percent of capital expenditures by manufacturers for new plant and equipment, 1951 through 1954, and 1954 through 1962, by states.

States	X_{11} 1951 thru 1954	X_{12} 1954 thru 1962
Alabama[1]		
Arizona[2]	56.97	28.85
Arkansas	19.89	19.74
California	18.86	26.67
Colorado	25.00	25.44
Connecticut	16.43	17.48
Delaware	22.36	27.39
Florida	13.74	13.16
Georgia	16.00	14.02
Idaho	25.56	26.25

Table 16. (Continued)

States	X_{11} 1951 thru 1954	X_{12} 1954 thru 1962
Illinois	1.43	1.64
Indiana	.83	.94
Iowa	5.74	5.04
Kansas	10.01	13.82
Kentucky	10.78	16.83
Louisiana[3]		
Maine	5.02	5.62
Maryland	17.87	12.06
Massachusetts	54.51	42.48
Michigan	5.67	8.59
Minnesota	28.14	29.54
Mississippi	36.38	33.85
Missouri[3]		
Montana[4]	15.63	13.61
Nebraska	4.61	5.26
Nevada[5]	11.00	13.79
New Hampshire	3.27	3.38
New Jersey	4.08	9.35
New Mexico[3]		
New York	31.47	36.39
North Carolina	38.46	31.85
North Dakota[6]	15.00	33.51
Ohio	1.72	3.81
Oklahoma	24.25	28.24
Oregon	25.32	22.80
Pennsylvania	20.60	14.45
Rhode Island	26.14	26.95
South Carolina	20.12	19.12
South Dakota	22.71	16.06
Tennessee	20.63	20.63
Texas	2.99	8.18
Utah	18.18	18.09
Vermont[4]	21.31	16.95
Virginia	30.31	26.80
Washington	2.46	3.60
West Virginia	2.01	1.72
Wisconsin	30.83	24.96
Wyoming	1.77	4.55

[1]See Table 15, Footnote 1.
[2]See Table 15, Footnote 2.
[3]See Table 15, Footnote 3.
[4]See Table 8, Footnote 1.
[5]See Table 8, Footnote 2.
[6]See Table 8, Footnote 3.

Table 16. (Continued)

Sources: X_{11} Tax: U. S. Bureau of the Census, Compendium of State Government Finances in 1951, pp. 11-13; 1952, pp. 11-13; 1953, pp. 11-13; 1954, pp. 11-13. New capital expenditures: U. S. Bureau of the Census, Annual Survey of Manufactures, 1951, pp. 118-19; 1952, pp. 106-07; 1953, pp. 115-16; Census of Manufactures, 1958, Vol. I, Summary Statistics, pp. 5-14 and 5-15.

X_{12} Tax: Compendium of State Government Finances, 1954, pp. 11-13; 1955, pp. 11-13; 1956, pp. 11-13; 1957, pp. 11-13; 1958, pp. 11-13; 1959, pp. 11-13; 1960, pp. 13-15; 1961, pp. 11-13; 1962, pp. 11-13. New capital expenditures: Census of Manufactures, 1958, Vol. I, pp. 5-14 and 5-15; Annual Survey of Manufactures, 1956, pp. 12-13; 1957, pp. 10-11; 1959 and 1960, pp. 16-25; 1962, pp. 18-26.

TABLE 17. Total state business taxes as a percent of value added by manufacture, 1947 plus 1949 through 1954, and 1954 through 1962, by states.

States	X_{13} 1947 plus 1949 thru 1954	X_{14} 1954 thru 1962
Alabama[1]		
Arizona[2]	3.18	2.04
Arkansas	2.31	1.71
California	1.36	1.58
Colorado	1.72	1.68
Connecticut	.73	.89
Delaware	1.72	3.02
Florida	1.43	1.34
Georgia	1.39	1.09
Idaho	2.92	2.71
Illinois	.07	.09
Indiana	.04	.07
Iowa	.35	.32
Kansas	.64	.81
Kentucky	1.05	1.13
Louisiana[3]		
Maine	.26	.44
Maryland	.84	.93
Massachusetts	1.95	1.87
Michigan	.33	.57
Minnesota	1.41	1.47
Mississippi	2.95	2.64
Missouri[3]		
Montana	1.97	2.06

Table 17. (Continued)

States	X_{13} 1947 plus 1949 thru 1954	X_{14} 1954 thru 1962
Nebraska	.26	.38
Nevada	.73	.93
New Hampshire	.10	.16
New Jersey	.21	.53
New Mexico[3]		
New York	1.36	1.48
North Carolina	2.36	2.05
North Dakota[4]	4.53	4.79
Ohio	.12	.24
Oklahoma	2.38	2.12
Oregon	2.06	1.83
Pennsylvania	1.53	.90
Rhode Island	1.13	1.13
South Carolina[4]	1.77	1.36
South Dakota	.73	.96
Tennessee	1.51	1.60
Texas	.42	.88
Utah	1.46	1.27
Vermont	.83	.95
Virginia	1.93	1.92
Washington	.16	.28
West Virginia	.17	.20
Wisconsin	1.57	1.31
Wyoming	.37	.54

[1]See Table 15, Footnote 1.
[2]See Table 15, Footnote 2.
[3]See Table 15, Footnote 3.
[4]See Table 5, Footnote 1.

Sources: X_{13} Tax: U. S. Bureau of the Census, Compendium of State Government Finances, 1947, pp. 10-12; 1949, pp. 10-12; 1950, pp. 10-12; 1951, pp. 11-13; 1952, pp. 11-13; 1953, pp. 11-13; 1954, pp. 11-13. Value added by manufacture: Statistical Abstract of the United States, 1955, pp. 816-17; 1952, p. 782; 1953, pp. 804-05; 1959, pp. 788-89.

X_{14} Tax: Compendium of State Government Finances, 1954, pp. 11-13; 1955, pp. 11-13; 1956, pp. 11-13; 1957, pp. 11-13; 1958, pp. 11-13; 1959, pp. 11-13; 1960, pp. 13-15; 1961, pp. 11-13; 1962, pp. 11-13. Value added by manufacture: Annual Survey of Manufactures, 1956, pp. 12-13; 1957, pp. 10-11; Statistical Abstract, 1959, pp. 788-89; 1962, pp. pp. 780-81; 1963, pp. 782-83; 1964, pp. 778-79.

TABLE 18. Total state and local property taxes as a percent of total personal income, 1953, and 1953 plus 1958, by states.

States	X_{15} 1953	X_{16} 1953 plus 1958
Alabama	1.62	3.17
Arizona	3.71	8.47
Arkansas	2.00	4.42
California	3.78	8.48
Colorado	4.25	9.21
Connecticut	3.09	6.94
Delaware	1.15	2.43
Florida	3.03	6.32
Georgia	2.25	4.84
Idaho	4.68	9.56
Illinois	3.23	7.01
Indiana	3.29	7.53
Iowa	5.17	10.17
Kansas	4.67	10.27
Kentucky	2.45	5.18
Louisiana	2.24	4.65
Maine	4.48	9.35
Maryland	2.61	5.85
Massachusetts	4.95	10.35
Michigan	3.04	7.62
Minnesota	4.74	10.02
Mississippi	2.90	5.95
Missouri	2.52	5.50
Montana	4.15	9.96
Nebraska	5.45	10.74
Nevada	3.64	7.29
New Hampshire	6.47	11.71
New Jersey	4.22	9.13
New Mexico	1.79	3.66
New York	3.89	8.44
North Carolina	2.21	4.62
North Dakota	5.79	11.25
Ohio	2.65	6.32
Oklahoma	2.59	5.49
Oregon	3.61	8.26
Pennsylvania	2.35	4.91
Rhode Island	1.88	5.88
South Carolina	2.09	4.14
South Dakota	5.99	12.26
Tennessee	2.16	4.84
Texas	3.04	6.84
Utah	3.81	8.10
Vermont	4.32	10.05
Virginia	2.09	4.73

Table 18. (Continued)

States	X_{15} 1953	X_{16} 1953 plus 1958
Washington	2.40	5.13
West Virginia	1.63	3.80
Wisconsin	4.92	9.96
Wyoming	4.25	9.43

Sources: X_{15} Tax: U. S. Bureau of the Census, State and Local Government Revenue in 1953, State and Local Government Special Studies, No. 37, pp. 10-13. Personal income: U. S. Bureau of the Census, Statistical Abstract of the United States, 1953, p. 299.

X_{16} Tax: U. S. Bureau of the Census, Governmental Finances in 1958, p. 23; State and Local Government Revenue in 1953, No. 37, pp. 10-13. Personal income: Statistical Abstract, 1953, p. 299; 1961, p. 307.

TABLE 19. Total state general sales taxes as a percent of total personal income, 1947 through 1954, and 1954 through 1962, by states.

States	X_{17} 1947 thru 1954	X_{18} 1954 thru 1962
Alabama	1.328	1.779
Arizona	1.783	2.020
Arkansas	1.458	1.980
California	1.708	1.623
Colorado	1.361	1.260
Connecticut	.710	1.114
Delaware[1]	.005	
Florida	.832	1.516
Georgia	1.028	2.239
Idaho[2]		
Illinois	1.079	1.282
Indiana	1.363	1.674
Iowa	1.428	1.500
Kansas	1.418	1.510
Kentucky[3]		.445
Louisiana	1.437	1.648
Maine	.416	1.315
Maryland	.654	.822
Massachusetts[2]		

Table 19. (Continued)

States	X_{17} 1947 thru 1954	X_{18} 1954 thru 1962
Michigan	2.013	2.028
Minnesota[2]		
Mississippi	1.672	2.498
Missouri	1.271	1.228
Montana[2]		
Nebraska[2]		
Nevada[3]		1.211
New Hampshire[2]		
New Jersey[2]		
New Mexico	2.337	2.351
New York[2]		
North Carolina	1.114	1.237
North Dakota	1.463	1.444
Ohio	1.182	1.108
Oklahoma	1.412	1.329
Oregon[2]		
Pennsylvania[4]	.027	.881
Rhode Island	.613	1.104
South Carolina	.801	1.921
South Dakota	1.537	1.363
Tennessee	1.204	1.757
Texas[5]		.097
Utah	1.569	1.638
Vermont[2]		
Virginia[2]		
Washington	2.833	3.540
West Virginia	2.220	2.687
Wisconsin[5]		.019
Wyoming	1.447	1.551

[1]For the first period state general sales tax collections were insignificant. For the second period there was no general sales tax.

[2]No state general sales tax for either period.

[3]No state general sales tax for the first period.

[4]For the first period state general sales tax collections were insignificant.

[5]No state general sales tax for the first period. For the second period state general sales tax collections were insignificant.

Sources: X_{17} Sales taxes: U. S. Bureau of the Census, Compendium of State Government Finances, 1947, pp. 10-12; 1948, pp. 10-12; 1949, pp. 10-12; 1950, pp. 10-12; 1951, pp. 11-13; 1952, pp. 11-13; 1953, pp. 11-13; 1954, pp. 11-13. (Con.)

Table 19. (Continued)

Personal income: Statistical Abstract of the United States, 1949, p. 284; 1950, p. 266; 1952, p. 284; 1953, p. 299.

X_{18} Sales taxes: Compendium of State Government Finances, 1954, pp. 11-13; 1955, pp. 11-13; 1956, pp. 11-13; 1957, pp. 11-13; 1958, pp. 11-13; 1959, pp. 11-13; 1960, pp. 13-15; 1961, pp. 11-13; 1962, pp. 11-13. Personal income: Statistical Abstract, 1953, p. 299; 1955, p. 311; 1961, p. 307; 1964, p. 329.

TABLE 20. Total state personal income taxes as a percent of total personal income, 1947 through 1954, and 1954 through 1962, by states.

States	X_{19} 1947 thru 1954	X_{20} 1954 thru 1962
Alabama[1]		
Arizona[2]	.352	.391
Arkansas	.214	.335
California	.337	.467
Colorado	.529	.872
Connecticut[3]		
Delaware	.763	1.697
Florida[3]		
Georgia	.342	.513
Idaho	.736	1.167
Illinois[3]		
Indiana[3]		
Iowa	.435	.597
Kansas	.359	.441
Kentucky	.405	.910
Louisiana[4]		
Maine[3]		
Maryland	.514	.960
Massachusetts	.696	.239
Michigan[3]		
Minnesota	.860	1.000
Mississippi	.272	.266
Missouri[4]		
Montana	.426	.709
Nebraska[3]		
Nevada[3]		
New Hampshire	.167	.134
New Jersey[5]		
New Mexico[4]		

Table 20. (Continued)

States	X_{19} 1947 thru 1954	X_{20} 1954 thru 1962
New York	.761	1.371
North Carolina	.725	.986
North Dakota	.463	.395
Ohio[3]		
Oklahoma	.314	.387
Oregon	1.429	2.069
Pennsylvania[3]		
Rhode Island[3]		
South Carolina	.546	.667
South Dakota[3]		
Tennessee	.091	.093
Texas[3]		
Utah	.512	.741
Vermont	.804	1.405
Virginia	.558	1.021
Washington[3]		
West Virginia[6]		
Wisconsin	.937	1.440
Wyoming[3]		

[1]Data are not used because for certain years state corporate income tax collections, except those for financial institutions, are included with state personal income tax collections.

[2]Personal income tax for 1957 is interpolated.

[3]No state personal income tax for either period.

[4]Data are not used because corporate and personal income tax collections are included as one figure for certain years.

[5]No state personal income tax for the first period. For the second period state personal income tax collections were insignificant.

[6]No state personal income tax for the second period. For the first period state personal income tax collections were insignificant.

Sources: X_{19} Personal income tax: U. S. Bureau of the Census, Compendium of State Government Finances, 1947, pp. 10-12; 1948, pp. 10-12; 1949, pp. 10-12; 1950, pp. 10-12; 1951, pp. 11-13; 1952, pp. 11-13; 1953, pp. 11-13; 1954, pp. 11-13. Personal income: Statistical Abstract of the United States, 1949, p. 284; 1950, p. 266; 1952, p. 284; 1953, p. 299.

X_{20} Personal income tax: Compendium of State Government

Table 20. (Continued)

Finances, 1954, pp. 11-13; 1955, pp. 11-13; 1956, pp. 11-13; 1957, pp. 11-13; 1958, pp. 11-13; 1959, pp. 11-13; 1960, pp. 13-15; 1961, pp. 11-13; 1962, pp. 11-13. Personal income: Statistical Abstract, 1953, p. 299; 1955, p. 311; 1961, p. 307; 1964, p. 329.

TABLE 21. Existence or nonexistence of a state personal income tax, 1947 (X_{21}) and 1955 (X_{22}), state general sales tax, 1947 (X_{23}) and 1955 (X_{24}), or state corporate income tax, 1947 (X_{25}) and 1955 (X_{26}).

States	X_{21}	X_{22}	X_{23}	X_{24}	X_{25}	X_{26}
Alabama	Yes	Yes	Yes	Yes	Yes	Yes
Arizona	Yes	Yes	Yes	Yes	Yes	Yes
Arkansas	Yes	Yes	Yes	Yes	Yes	Yes
California	Yes	Yes	Yes	Yes	Yes	Yes
Colorado	Yes	Yes	Yes	Yes	Yes	Yes
Connecticut	No	No	Yes	Yes	Yes	Yes
Delaware	Yes	Yes	No	No	No	No
Florida	No	No	No	Yes	No	No
Georgia	Yes	Yes	No	Yes	Yes	Yes
Idaho	Yes	Yes	No	No	Yes	Yes
Illinois	No	No	Yes	Yes	No	No
Indiana	No	No	Yes	Yes	No	No
Iowa	Yes	Yes	Yes	Yes	Yes	Yes
Kansas	Yes	Yes	Yes	Yes	Yes	Yes
Kentucky	Yes	Yes	No	No	Yes	Yes
Louisiana	Yes	Yes	Yes	Yes	Yes	Yes
Maine	No	No	No	Yes	No	No
Maryland	Yes	Yes	Yes	Yes	Yes	Yes
Massachusetts	Yes	Yes	No	No	Yes	Yes
Michigan	Yes	No	Yes	Yes	No	No
Minnesota	Yes	Yes	No	No	Yes	Yes
Mississippi	Yes	Yes	Yes	Yes	Yes	Yes
Missouri	Yes	Yes	Yes	Yes	Yes	Yes
Montana	Yes	Yes	No	No	Yes	Yes
Nebraska	No	No	No	No	No	No
Nevada	No	No	No	Yes	No	No
New Hampshire	Yes	Yes	No	No	No	No
New Jersey	No	No	No	No	No	Yes
New Mexico	Yes	Yes	Yes	Yes	Yes	Yes
New York	Yes	Yes	No	No	Yes	Yes
North Carolina	Yes	Yes	Yes	Yes	Yes	Yes
North Dakota	Yes	Yes	Yes	Yes	Yes	Yes
Ohio	Yes	No	Yes	Yes	No	No

Table 21. (Continued)

States	X_{21}	X_{22}	X_{23}	X_{24}	X_{25}	X_{26}
Oklahoma	Yes	Yes	Yes	Yes	Yes	Yes
Oregon	Yes	Yes	No	No	Yes	Yes
Pennsylvania	No	No	No	Yes	Yes	Yes
Rhode Island	No	No	Yes	Yes	Yes	Yes
South Carolina	Yes	Yes	No	Yes	Yes	Yes
South Dakota	No	No	Yes	Yes	Yes	Yes
Tennessee	Yes	Yes	Yes	Yes	Yes	Yes
Texas	No	No	No	No	No	No
Utah	Yes	Yes	Yes	Yes	Yes	Yes
Vermont	Yes	Yes	No	No	Yes	Yes
Virginia	Yes	Yes	No	No	Yes	Yes
Washington	No	No	Yes	Yes	No	No
West Virginia	No	No	Yes	Yes	No	No
Wisconsin	Yes	Yes	No	No	Yes	Yes
Wyoming	No	No	Yes	Yes	No	No

Sources: X_{21} The Council of State Governments, The Books of the States: 1948-49, p. 230.

X_{22} The Council of State Governments, The Books of the States: 1956-57, p. 228.

X_{23} Ibid., 1948-49, p. 233.

X_{24} Ibid., 1956-57, p. 230.

X_{25} Ibid., 1948-49, p. 231.

X_{26} Ibid., 1956-57, p. 229.

CHAPTER III

THE ANALYSIS

This chapter employs the values compiled in Chapter II to investigate the relationship between state and local tax differentials and state economic growth. The analysis is divided into 36 different sections, each introduced by a proposition that associates a state economic growth variable with a state tax variable. The validity of each proposition is then tested. With the exception of Sections 34 through 36, wherein a two period ordering process is used, three sets of computations are made to test each proposition. These computations (tests) involve 1) relating a dependent variable of the first period to an independent variable of the first period, 2) relating a dependent variable of the second period to an independent variable of the second period, and 3) relating the dependent variable employed in the second test to the independent variable employed in the first test. After each proposition has been tested the results are presented and discussed. The methodology basically involves simple correlation and linear regression. In order to facilitate the interpretation of the correlation results, the coefficient of correlation ($\underline{r}$) in terms of its square is also employed. The square of the coefficient of correlation is known as the coefficient of determination and is designated by $\underline{r}^2$. When multiplied by 100 the coefficient $\underline{r}^2$ gives the percentage of the variation in the dependent variable that is associated with (statistically explained but not necessarily caused by) the variation in the independent

variable. For example, when r is equal to .80 the percentage of the variation in the dependent variable that is accounted for by variation in the independent variable is 64. The percentage of the variation in the dependent variable which is not associated with the variation in the independent variable is 36.

Proposition 1

Total personal income (Y_1, Y_2) tends to increase more rapidly where total state and local taxes (X_1, X_2) are lower.

Test Results[1]

Computations

	Mean $Y(10^6)$	Mean $X(10^6)$	r	r^2	$a(10^6)$	b
Y_1, X_1	$2,118	$ 433	.936	.877	132.04	4.58
Y_2, X_2	3,000	1,063	.960	.923	-13.55	2.83
Y_2, X_1	3,000	433	.946	.896	8.97	6.90

Discussion. The very high coefficients of determination in all these tests indicate a strong association between the deviations in the

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[1]The results of three tests are presented. Y_1, which represents the change in total personal income, by states, in the first period, is related to X_1, which represents the measure of total state and local taxes, by states, in the first period. Y_2, which represents the change in total personal income, by states, in the second period, is related to X_2, which represents the measure of total state and local taxes, by states, in the second period. The third test (a time lag calculation) relates Y_2 to X_1. The coefficient of correlation is designated by r; the coefficient of determination is designated by r^2; the intercept of the line of regression is designated by a; the slope of the line of regression is designated by b. The value shown for the mean of Y and the mean of X must be multiplied by 10^6. Although there are certain dissimilarities, the same general format is employed to present the results of each proposition 1 through 33.

dependent variables and the deviations in the independent variables.[2] However, the positive coefficients of correlation accompanied by positive slope values fail to support the proposition that total personal income tends to increase more rapidly where total state and local taxes are lower. In fact, just the contrary is inferred from the results. In each instance total personal income increases with higher absolute tax loads. This result is explained in the discussion after Proposition 3.

Proposition 2

Total value added by manufacture (Y_7, Y_8) tends to increase more rapidly where total state and local taxes (X_1, X_2) are lower.

Test Results

Computations

	Mean Y(10^6)	Mean X(10^6)	r	r^2	a(10^6)	b
Y_7, X_1	$ 1052	$ 433	.894	.800	27.23	2.36
Y_8, X_2	900	1063	.901	.812	105.34	.74
Y_8, X_1	900	433	.885	.783	113.95	1.81

Discussion. The coefficient of determination in the first period

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[2]Computations in Propositions 1 through 15 and 25 through 30 are based upon 48 observations. Throughout the inquiry, an .05 level of statistical significance is employed. For 48 observations a coefficient of correlation, to be statistically significant at the .05 level, must be equal to ± .2835. This means that the probability that a coefficient of ± .2835 could arise by chance is only five in one hundred. Following the same logic, a coefficient of determination involving 48 observations, to be statistically significant at the .05 level, must be equal to $(.2835)^2$ or .0804. Coefficients of correlation of less than ± .2835 or coefficients of determination of less than .0804 cannot be used to support the hypothesis or its inverse.

is .80. This means that 80 percent of the variation in the total value added by manufacture is associated with the variation in total state and local taxes. This high coefficient of determination is matched by coefficients of .812 in the second period and .783 in the time lag test. The coefficients of correlation and the slope values are positive across the board. The high positive coefficients of correlation fail to support the proposition that total value added by manufacture tends to increase more rapidly where total state and local taxes are lower. Indeed, the inverse hypothesis is inferred: total value added by manufacture increases more rapidly where total state and local taxes are higher.

Proposition 3

Total capital expenditures by manufacturers for new plant and equipment (Y_{13}, Y_{14}) tend to increase more rapidly where total state and local taxes (X_1, X_2) are lower.

Test Results

Computations

	Mean $Y(10^6)$	Mean $X(10^6)$	r	r^2	$a(10^6)$	b
Y_{13}, X_1	\$ 5.35	\$ 433	.081	.0065	1.43	.009
Y_{14}, X_2	40.25	1063	.471	.221	12.12	.026
Y_{14}, X_1	40.25	433	.465	.216	12.26	.064

Discussion. Since the coefficients of correlation for 48 observations are significant at the .05 level only when r is equal to $\pm$ .2835 or larger, it is evident that the value of r resulting from the employment

of first period data is too low to be significant. The coefficients of correlation for the second and third tests are statistically significant; however, the positive results fail to support the hypothesis that total new capital expenditures by manufacturers tend to be greater where total state and local taxes are lower. Indeed, the reverse hypothesis is inferred.

The computations in Sections 1 through 3 demonstrate a consistent pattern of direct association between the absolute tax burden differentials and absolute economic growth. The author expected this result. The propositions were formulated and the computations were made to test the general contention that absolute growth is greater where absolute taxes are lower. The reason for the direct association is apparent. Those states which experience the greater absolute increases in personal income, value added by manufacture, and capital expenditures by manufacturers for new plant and equipment--i.e., the large industrial states--also exact the greater quantity of state and local tax collections from their citizens. (At the same time, the tax base increases directly with increased economic activity.) The result is a bias toward direct association or positive correlation.

Proposition 4

Per capita personal income (Y_3, Y_4) tends to increase more rapidly where total state and local taxes as a percent of total personal income (X_3,X_4) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_3, X_3	$ 416	.078	-.538	.290	1017	-7639
Y_4, X_4	530	.166	.018	.0003	517	78
Y_4, X_3	530	.078	.070	.0049	488	530

Discussion. The exceedingly small coefficients of determination in the second and third tests fail to show any appreciable association between the variations in the dependent variables and the variations in the independent variables. Even though the coefficient of correlation for the first period is negative and statistically significant, the overall results lend little support to the hypothesis that per capita personal income tends to increase more rapidly where total state and local taxes as a percent of total personal income are lower.

Proposition 5

Per capita value added by manufacture (Y_9, Y_{10}) tends to increase more rapidly where total state and local taxes as a percent of total personal income (X_3, X_4) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_9, X_3	$ 213	.078	-.560	.314	577	-4631
Y_{10}, X_4	144	.166	-.128	.016	214	- 419
Y_{10}, X_3	144	.078	-.116	.013	197	- 673

Discussion. An examination of the results reveals three negative coefficients of correlation. The coefficient of correlation for the first period is statistically significant. Even though the coefficients of determination are low, the overall results lend some support to the hypothesis that per capita value added by manufacture tends to increase more rapidly where total state and local taxes as a percent of total personal income are lower.

Proposition 6

Per capita capital expenditures by manufacturers for new plant and equipment (Y_{15}, Y_{16}) tend to increase more rapidly where total state and local taxes as a percent of total personal income (X_3, X_4) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{15}, X_3	$ .766	.078	.099	.0098	- 7.14	100.68
Y_{16}, X_4	6.992	.166	-.257	.0663	33.25	-157.51
Y_{16}, X_3	6.992	.078	-.190	.0364	23.19	-206.17

Discussion. Neither the low positive coefficient of correlation for the first period nor the negative coefficients resulting from the second and third tests are significant. The results fail to show any appreciable association between the variances in per capita capital expenditures by manufacturers for new plant and equipment and the variances in state and local taxes as a percent of total personal income.

Taken in concert, the results in Sections 4, 5, and 6 provide little evidence of an association between the deviations in the per capita growth indicators and deviations in state and local taxes as a percent of total personal income.

Proposition 7

The percentage increase in personal income (Y_5, Y_6) tends to be greater where per capita state and local taxes (X_5, X_6) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_5, X_5	.530	$ 126.59	.154	.0238	.350	.0014
Y_6, X_6	.527	269.15	.218	.0475	.346	.0006
Y_6, X_5	.527	126.59	.282	.0798	.301	.0017

Discussion. Not one of these simple correlation coefficients is statistically significant at the .05 level. The highest coefficient of determination appears in the time lag test, and here only 7.9 percent of the variation in the percentage change in personal income is associated with the variation in per capita state and local taxes. The overall results fail to lend any support to the proposition that the percentage increase in personal income tends to be greater where per capita state and local taxes are lower.

Proposition 8

The percentage increase in value added by manufacture (Y_{11}, Y_{12}) tends to be greater where per capita state and local taxes (X_5, X_6) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{11}, X_5	.752	$126.59	.151	.0228	.529	.0017
Y_{12}, X_6	.445	296.15	-.118	.0140	.592	-.0005
Y_{12}, X_5	.445	126.59	-.046	.0021	.501	-.0004

Discussion. Very low coefficients of determination fail to provide evidence of a significant association between variations in the dependent variables and variations in the independent variables. The results do not support the hypothesis that the percentage increase in value added by manufacture tends to be greater where per capita state and local taxes are lower.

Proposition 9

The percentage increase in capital expenditures by manufacturers for new plant and equipment (Y_{17}, Y_{18}) tends to be greater where per capita state and local taxes (X_5, X_6) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{17}, X_5	.172	$126.59	.062	.0038	.027	.0014
Y_{18}, X_6	.446	296.15	-.098	.0096	.739	-.0009
Y_{18}, X_5	.446	126.59	-.062	.0038	.625	-.0014

Discussion. Extremely low coefficients of correlation and coefficients of determination of less than one percent in each of the three tests fail to demonstrate any significant relationship between the dependent and independent variables. The proposition that the percentage increase in capital expenditures by manufacturers for new plant and equipment tends to be greater where per capita state and local taxes are lower is not supported.

A review of the results in Sections 7, 8, and 9 reveals very small coefficients of determination ranging from a low of .0021 to a high of .0798. This indicates that only a minor fraction of the deviations in the percentage increases in the growth indexes are explained by the deviations in per capita state and local taxes.

Proposition 10

The percentage increase in personal income (Y_5, Y_6) tends to be greater where total state and local taxes as a percent of total personal income (X_3, X_4) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_5, X_3	.530	.078	-.314	.098	.951	-5.35
Y_6, X_4	.527	.166	.185	.034	.323	1.22
Y_6, X_3	.527	.078	.207	.043	.336	2.41

Discussion. Even though the negative coefficient of correlation in the first period is statistically significant, the coefficient of determination associates only 9.8 percent of the variation in the dependent variable with the variation in the independent variable. Statistically insignificant and positive coefficients of correlation in the second and third tests fail to support the proposition. Taken in concert the results fail to demonstrate a significant relationship between the dependent and independent variables.

Proposition 11

The percentage increase in value added by manufacture (Y_{11}, Y_{12}) tends to be greater where total state and local taxes as a percent of total personal income (X_3, X_4) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{11}, X_3	.752	.078	-.010	.0001	.770	-.226
Y_{12}, X_4	.445	.166	.205	.0423	.106	2.032
Y_{12}, X_3	.445	.078	.234	.0552	.123	4.099

Discussion. Low coefficients of determination fail to indicate a pronounced association between the variances in the dependent variables and the variances in the independent variables. It is apparent that the results do not support the hypothesis that the percentage increase in value added by manufacture tends to be greater where total state and local taxes as a percent of total personal income are lower.

Proposition 12

The percentage increase in capital expenditures by manufacturers for new plant and equipment (Y_{17}, Y_{18}) tends to be greater where total state and local taxes are a percent of total personal income (X_3, X_4) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{17}, X_3	.172	.078	.049	.0024	.038	1.70
Y_{18}, X_4	.446	.166	.096	.0092	.065	2.28
Y_{18}, X_3	.446	.078	.122	.0150	.041	5.15

Discussion. Very low coefficients of determination indicate that virtually none of the deviations in the dependent variables are statistically explained by deviations in the independent variables. Nothing in these results supports the hypothesis that the percentage increase in capital expenditures by manufacturers for new plant and equipment tends to be greater where total state and local taxes as a percent of total personal income are lower.

The results presented in Sections 10, 11, and 12 fail to provide evidence of a reliable relationship between the deviations in the rate of growth variables and the deviations in state and local taxes as a percent of total personal income.

Proposition 13

The percentage increase in personal income (Y_5, Y_6) tends to be greater where total state and local taxes as a percent of total personal income divided by per capita personal income (X_7, X_8) are lower.

Test Results

Computations

	Mean Y	Mean X(10-4)	r	r^2	a	b
Y_5, X_7	.530	.514	-.427	.1827	.834	- 5911.58
Y_6, X_8	.527	.992	.048	.0023	.500	270.05
Y_6, X_7	.527	.514	.065	.0042	.495	614.85

Discussion. The statistically significant negative coefficient of correlation of the first period lends some support to the hypothesis. However, the coefficients of determination of the second and third tests are very low; i.e., virtually none of the deviations in the dependent variables are associated with the deviations in the independent variables. It is apparent that the overall results fail to provide significant support for the proposition.

Proposition 14

The percentage increase in value added by manufacture (Y_{11}, Y_{12}) tends to be greater where total state and local taxes as a percent of total personal income divided by per capita personal income (X_7, X_8) are lower.

Test Results

Computations

	Mean Y	Mean X(10-4)	r	r^2	a	b
Y_{11},X_7	.752	.514	-.079	.0063	.823	-1388.21
Y_{12},X_8	.445	.992	.278	.0777	.215	2324.06
Y_{12},X_7	.445	.514	.270	.0731	.248	3829.59

Discussion. Low coefficients of determination for all tests fail to provide evidence of a reliable relationship between the variations in the dependent variables and variations in the independent variables. The results do not support the hypothesis that the percentage increase in value added by manufacture tends to be greater where total state and local taxes as a percent of total personal income divided by per capita personal income are lower.

Proposition 15

The percentage increase in capital expenditures by manufacterers for new plant and equipment (Y_{17}, Y_{18}) tends to be greater where total state and local taxes as a percent of total personal income divided by per capita personal income (X_7, X_8) are lower.

Test Results

Computations

	Mean Y	Mean X(10-4)	r	r^2	a	b
Y_{17}, X_7	.172	.514	-.0062	$.386(10^{-4})$	.181	-172
Y_{18}, X_8	.446	.992	.187	.035	.072	3765
Y_{18}, X_7	.446	.514	.186	.034	.119	6367

Discussion. Low coefficients of determination for all tests fail to demonstrate a significant association between variations in the dependent variables and variations in the independent variables. It follows that the proposition is not supported.

The evidence presented in Sections 13, 14, and 15 does not support the general hypothesis that state by state deviations in the rate of growth indicators are negatively associated with deviations in total state and local taxes as a percent of total personal income divided by per capita personal income. Indeed, no reliable relationship between the dependent and independent variables is demonstrated.

Proposition 16

Total personal income (Y_1, Y_2) tends to increase more rapidly where total state business taxes (X_9, X_{10}) are lower.

Test Results

Computations[3]

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[3]Computations in Propositions 16 through 24 and 31 through 33 are based upon 44 observations. For 44 observations a coefficient of

	Mean Y(10^6)	Mean X(10^6)	r	r^2	a(10^6)	b
Y_1, X_9	$2182	$160	.664	.440	1140	6.50
Y_2, X_{10}	3101	286	.868	.754	830	7.92
Y_2, X_9	3101	160	.703	.494	1455	10.26

Discussion. Strong positive coefficients fail to support the hypothesis. In fact, just the contrary is inferred from the results. In each instance greater increases in total personal income are directly associated with higher absolute state business tax loads.

Proposition 17

Total value added by manufacture (Y_7, Y_8) tends to increase more rapidly where total state business taxes (X_9, X_{10}) are lower.

Test Results

Computations

	Mean Y(10^6)	Mean X(10^6)	r	r^2	a(10^6)	b
Y_7, X_9	$1094	$160	.652	.425	541	3.44
Y_8, X_{10}	938	286	.790	.624	361	2.01
Y_8, X_9	938	160	.601	.361	545	2.45

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correlation to be statistically significant at the conventional .05 level must be equal to ± .297. This means that the probability that a coefficient of ± .297 could arise by chance is only five in one hundred. Following the same logic, a coefficient of determination involving 44 observations to be statistically significant at the .05 level must be equal to $(.297)^2$ or .088. Coefficients of correlation of less than ± .297 or coefficients of determination of less than .088 cannot be used to support the hypothesis or its inverse.

Discussion. Positive coefficients of correlation well above the significance minimum in all three tests fail to support the hypothesis. In fact, the inverse hypothesis is inferred; i.e., total value added by manufacture tends to increase more rapidly where total state business taxes are higher.

Proposition 18

Total capital expenditures by manufacturers for new plant and equipment (Y_{13}, Y_{14}) tend to increase more rapidly where total state business taxes (X_9, X_{10}) are lower.

Test Results

Computations

	Mean $Y(10^6)$	Mean $X(10^6)$	r	r^2	$a(10^6)$	b
Y_{13},X_9	\$ 6.87	\$ 160	-.184	.034	13.4	-.040
Y_{14},X_{10}	40.80	286	.468	.219	17.4	.081
Y_{14},X_9	40.80	160	.414	.171	22.3	.115

Discussion. The negative coefficient of correlation of .184 for the first period is statistically insignificant at the .05 level. (With 44 observations, the coefficient of correlation must be equal to or greater than ± .297 in order to meet the significance test.) Coefficients of correlation of positive .467 and .414 in the second and third tests fail to support the proposition that large absolute increases in capital expenditures by manufacturers for new plant and equipment result from low absolute business taxes. The overall results support the reverse hypothesis; i.e., large absolute increases in capital expenditures

are directly associated with higher absolute state business tax loads.

The computation results in Sections 16 through 18 demonstrate a strong pattern of direct association between variations in absolute business tax burdens and variations in absolute state economic growth. The big industrialized states enjoy such a head-start on the less industrialized states states that it would be virtually impossible for the latter to grow more on an absolute basis in a "short" period--and since these industrialized states are also "high" business tax states the generally high positive correlations came as no surprise. Nevertheless, the results serve to discredit the naive general contention that absolute growth is greater in the states where state business tax collections are lower.

Propositions 19

Per capita personal income (Y_3, Y_4) tends to increase more rapidly where total state business taxes as a percent of capital expenditures by manufacturers for new plant and equipment (X_{11}, X_{12}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_3, X_{11}	$ 415	.178	$-.445(10^{-3})$	$.198(10^{-6})$	415	-.747
Y_4, X_{12}	535	.175	.219	.048	495	231.20
Y_4, X_{11}	535	.178	.148	.021	513	126.69

Discussion. Very low coefficients of determination fail to provide suitable evidence of a significant association between variations in the dependent variables and variations in the independent variables. It is apparent that the results do not support the proposition that per capita personal income tends to increase more rapidly where total state business taxes as a percent of capital expenditures by manufacterers for new plant and equipment are lower.

Proposition 20

Per capita value added by manufacture (Y_9, Y_{10}) tends to increase more rapidly where total state business taxes as a percent of capital expenditures by manufacterers for new plant and equipment (X_{11}, X_{12}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_9, X_{11}	$ 217	.178	-.266	.0709	263	-256
Y_{10}, X_{12}	150	.175	.075	.0056	139	58
Y_{10}, X_{11}	150	.178	.151	.0230	133	96

Discussion. Coefficients of determination ranging from 7 percent in the first period to a low of .5 of 1 percent in the second period fail to demonstrate a significant association between the state-by-state variations in growth of per capita value added by manufacture and variations in total state business taxes as a percent of capital expenditures by manufacturers for new plant and equipment.

Proposition 21

Per capita capital expenditures by manufacturers for new plant and equipment (Y_{15}, Y_{16}) tend to increase more rapidly where total state business taxes as a percent of capital expenditures by manufacturers for new plant and equipment (X_{11}, X_{12}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{15}, X_{11}	$1.17	.178	-.067	.0045	2.59	-7.96
Y_{16}, X_{12}	7.08	.175	.253	.0641	.008	39.74
Y_{16}, X_{11}	7.08	.178	.308	.0952	.074	39.24

Discussion. Only the time lag coefficient of determination is statistically significant at the .05 level. Even here, only 9.52 percent of the deviation in the dependent variable is associated with the deviation in the independent variable. It is evident that the results do not support the hypothesis.

A review of the computations resulting from the validity tests of Propositions 19, 20, and 21 reveals little evidence of any reliable association between variations in the dependent variables and variations in the independent variables. Of the nine coefficients of correlation, only one is significant at the .05 level. Coefficients of determination ranging from a low of $.198 \times 10^{-6}$ to a high of .0952 indicate that deviations in the per capita growth indexes are largely independent of deviations in total state business taxes as a percent of capital expenditures by manufacturers for new plant and equipment.

Proposition 22

The percentage increase in personal income (Y_5, Y_6) tends to be greater where total state business taxes as a percent of value added by manufacture (X_{13}, X_{14}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_5, X_{13}	.519	.0128	-.044	.0019	.534	-1.17
Y_6, X_{14}	.526	.0128	.247	.0611	.463	4.90
Y_6, X_{13}	.526	.0128	.288	.0832	.458	5.28

Discussion. All of the coefficients of determination are statistically insignificant. This means there is no reliable relationship between the deviations in the dependent variables and the deviations in the independent variables. The evidence fails to support the hypothesis.

Proposition 23

The percentage increase in value added by manufacture (Y_{11}, Y_{12}) tends to be greater where total state business taxes as a percent of value added by manufacture (X_{13}, X_{14}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{11}, X_{13}	.743	0128	.045	.0020	.723	1.49

	Mean Y	Mean X	r	r^2	a	b
Y_{12}, X_{14}	.464	.0128	.242	.0585	.374	6.96
Y_{12}, X_{13}	.464	.0128	.353	.1252	.343	9.38

Discussion. The coefficients of correlation in the first and second tests are statistically insignificant. The coefficient of correlation for the third test is statistically significant and weakly supports the reverse hypothesis. The overall results fail to demonstrate that the percentage of increase in value added by manufacture is reliably linked with deviations in total state business taxes as a percent of value added by manufacture.

Proposition 24

The percentage increase in capital expenditures by manufacturers for new plant and equipment (Y_{17}, Y_{18}) tends to be greater where total state business taxes as a percent of value added by manufacture (X_{13}, X_{14}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{17}, X_{13}	.169	.0128	.202	.041	.034	10.52
Y_{18}, X_{14}	.459	.0128	.020	$.402(10^{-3})$	.441	1.44
Y_{18}, X_{13}	.459	.0128	.028	$.794(10^{-3})$	.435	1.86

Discussion. Coefficients of determination of 4.1 percent in the first test and less than .1 of 1 percent in both the second and third

tests indicates that there is virtually no association between deviations in the percentage increase in capital expenditures by manufacturers for new plant and equipment and deviations in total state business taxes as a percent of value added by manufacture.

The overall computation results in Sections 22, 23, and 24 fail to significantly associate the deviations in the rate of growth variables with deviations in total state business taxes as a percent of value added by manufacture.

Proposition 25

The percentage increase in personal income (Y_5, Y_6) tends to be greater where total state and local property taxes as a percent of total personal income (X_{15}, X_{16}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_5, X_{15}	.530	.034	-.294	.0869	.731	-5.90
Y_6, X_{16}	.527	.073	.036	.0013	.508	.257
Y_6, X_{15}	.527	.034	.083	.0069	.488	1.14

Discussion. The coefficient of correlation of the first test, which barely meets the test of statistical significance, is negative. Therefore, it lends weak support to the hypothesis that the percentage increase in personal income tends to be greater where state and local property taxes as a percent of total personal income are lower. On the other hand, the coefficients of correlation for the second and third

tests are far too small to be statistically significant. The overall results do not demonstrate a reliable association between variations in the dependent variables and variations in the independent variables. It follows that the proposition is not supported.

Proposition 26

The percentage increase in value added by manufacture (Y_{11}, Y_{12}) tends to be greater where total state and local property taxes as a percent of total personal income (X_{15}, X_{16}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{11}, X_{15}	.752	.034	-.131	.0173	.865	-3.33
Y_{12}, X_{16}	.445	.073	.060	.0036	.399	.628
Y_{12}, X_{15}	.445	.034	.080	.0065	.389	1.65

Discussion. Very small determination coefficients for each of the three tests suggest an inconsequential association between deviations in the dependent variables and deviations in the independent variables. It is evident that the results do not support the hypothesis that the percentage increase in value added by manufacture tends to be greater where total state and local property taxes as a percent of total personal income are lower.

Proposition 27

The percentage increase in capital expenditures by manufacturers for new plant and equipment (Y_{17}, Y_{18}) tends to be greater where total state and local property taxes as a percent of total personal income (X_{15},X_{16}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{17},X_{15}	.172	.034	.094	.0089	.042	3.81
Y_{18},X_{16}	.446	.073	.072	.0052	.314	1.81
Y_{18},X_{15}	.446	.034	.087	.0076	.299	4.31

Discussion. The coefficients of determination in each of the three cases associate less than 1 percent of the deviations in the percentage increase in capital expenditures by manufacturers for new plant and equipment with the deviations in total state and local property taxes as a percent of total personal income. It is apparent that the proposition is not supported.

Taken in concert, the results in Sections 25, 26, and 27 fail to support the general hypothesis that the percentage increase in growth tends to be greater where total state and local property taxes as a percent of total personal income are lower. Generally low coefficients of determination signify a very weak association between deviations in the dependent variables and deviations in the independent variables.

Proposition 28

The percentage increase in personal income (Y_5, Y_6) tends to be greater where total state general sales taxes as a percent of total personal income (X_{17}, X_{18}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_5, X_{17}	.530	.0088	-.037	.0014	.541	-1.24
Y_6, X_{18}	.527	.0113	.115	.0133	.501	2.29
Y_6, X_{17}	.527	.0088	.068	.0046	.503	1.53

Discussion. The coefficients of determination are virtually zero. In the first test only .14 percent of the variation in the dependent variable is associated with the variation in the independent variable. Very low coefficients of determination in the second and third tests also show negligible association between the variations in the dependent and independent variables. The evidence does not support the proposition that personal income tends to be greater where total state general sales taxes as a percent of total personal income are lower.

Proposition 29

The percentage increase in value added by manufacture (Y_{11}, Y_{12}) tends to be greater where total state general sales taxes as a percent of total personal income (X_{17}, X_{18}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{11},X_{17}	.752	.0088	.193	.037	.681	8.02
Y_{12},X_{18}	.445	.0113	.177	.031	.385	5.26
Y_{12},X_{17}	.445	.0088	.173	.030	.393	5.85

Discussion. None of the coefficients of determination are statistically significant at the .05 level. In each instance, they associate less than 4 percent of the deviation in the dependent variable with the deviation in the independent variable. The evidence does not support the proposition that the percentage increase in value added by manufacture tends to be greater where total state general sales taxes as a percent of total personal income are lower.

Proposition 30

The percentage increase in capital expenditures by manufacturers for new plant and equipment (Y_{17}, Y_{18}) tends to be greater where total state general sales taxes as a percent of total personal income (X_{17}, X_{18}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	$r^2(10^{-2})$	a	b
Y_{17},X_{17}	.172	.0088	.026	.070	.157	1.75
Y_{18},X_{18}	.446	.0113	-.041	.172	.480	-2.97
Y_{18},X_{17}	.446	.0088	-.0087	.007	.452	- .708

Discussion. Extremely low coefficients of determination in each instance associate only a minor fraction of the deviations in the dependent variables with the deviations in the independent variables. Nothing in these results lends support to the hypothesis.

A review of Propositions 28, 29, and 30 reveals extremely low coefficients of determination and no coefficients of correlation which are statistically significant at the .05 level. The results of the computations fail to provide any evidence that state-by-state variations in the rate of growth are associated with variations in total state general sales taxes as a percent of total personal income.

Proposition 31

The percentage increase in personal income (Y_5, Y_6) tends to be greater where total state personal income taxes as a percent of total personal income (X_{19}, X_{20}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	$r^2(10^{-2})$	a	b
Y_5, X_{19}	.519	.0033	-.037	.139	.529	-2.83
Y_6, X_{20}	.526	.0048	.014	.020	.524	.471
Y_6, X_{19}	.526	.0033	.026	.067	.521	1.37

Discussion. Coefficients of determination approaching zero are much too low to be statistically significant. Virtually none of the deviations in the dependent variables are associated with the deviations in the independent variables. The results do not support the proposition

that the percentage increase in personal income tends to be greater where total state personal income taxes as a percent of total personal income are lower.

Proposition 32

The percentage increase in value added by manufacture (Y_{11}, Y_{12}) tends to be greater where total state personal income taxes as a percent of total personal income (X_{19}, X_{20}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{11}, X_{19}	.743	.0033	-.155	.024	.791	-14.77
Y_{12}, X_{20}	.464	.0048	.0047	$.223(10^{-4})$	.463	.226
Y_{12}, X_{19}	.464	.0033	.038	.0015	.454	2.96

Discussion. The coefficients of determination are very low. Virtually none of the variations in the dependent variables are statistically explained by the variations in the independent variables. The results do not support the proposition that the percentage increase in value added by manufacture tends to be greater where total state personal income taxes as a percent ot total personal income are lower.

Proposition 33

The percentage increase in capital expenditures by manufacturers for new plant and equipment (Y_{17}, Y_{18}) tends to be greater where total

state personal income taxes as a percent of total personal income (X_{19}, X_{20}) are lower.

Test Results

Computations

	Mean Y	Mean X	r	r^2	a	b
Y_{17},X_{19}	.169	.0033	-.030	$.904(10^{-3})$	.184	-4.49
Y_{18},X_{20}	.459	.0048	.117	.013	.391	14.06
Y_{18},X_{19}	.459	.0033	.091	.0084	.401	17.51

Discussion. Low coefficients of determination fail to significantly associate the deviations in the percentage increase in capital expenditures by manufacturers for new plant and equipment with the deviations in total state personal income taxes as a percent of total personal income.

The computation results in Sections 31, 32, and 33 provide no evidence of a significant association between deviations in the dependent variables and deviations in the independent variables. The overall results fail to provide evidence that percentage changes in the growth indexes are statistically explained by differentials in total state personal income taxes as a percent of total personal income.

Proposition 34

Per capita personal income (Y_3, Y_4) tends to increase more rapidly where state personal income taxes (X_{21}, X_{22}) do not exist.

Tests for Validity

Testing the validity of this proposition involves a simple ordering process--and subsequent examination of the results--to determine whether or not states with no individual income tax have the greatest increase in per capita personal income. In the first instance, the Y_3 variable, which represents the change in per capita personal income, by states, 1947-1954, is related to the X_{21} variable, which represents the existence or nonexistence of a state personal income tax in 1947, by states. In the second instance, the Y_4 variable, which represents the change in per capita personal income, by states, 1954-1962, is related to the X_{22} variable, which represents the existence or nonexistence of a state personal income tax in 1955, by states.

Test results and discussion. There is no evidence that the mere existence of state personal income taxes results in low per capita state personal income increases. During the first period,[4] 60 percent of the states had increases in per capita personal income above the mean. In the same period, 64 percent of those states having no state personal income tax in 1947 had per capita personal income increases above the mean. In the second period,[5] 46 percent of the states had increases in per capita personal income above the mean. In the same period, 47 percent of those states having no state personal income tax in 1955 had per capita personal income increases above the mean. According to these

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[4]See Table 22.

[5]See Table 23.

results the existence of a state personal income tax has a neutral effect on changes in per capita personal income; it follows that the hypothesis is not supported.

Proposition 35

Per capita personal income (Y_3, Y_4) tends to increase more rapidly where state general sales taxes (X_{23}, X_{24}) do not exist.

Tests for Validity

Testing the validity of this proposition involves the same procedure as did Proposition 34.

Test results and discussion. In the first period,[6] 60 percent of the states had increase in per capita personal income above the mean. In the same period, 62 percent of the states having no state general sales tax in 1947 had per capita personal income increases above the mean. The results for the second period[7] are somewhat different. Increases in per capita personal income above the mean occurred in 46 percent of the states. On the other hand, of those states having no state general sales tax in 1955, approximately 67 percent had per capita personal income changes above the mean. The results of the second period comparisons would tend to support the hypothesis. However, the validity of such a conclusion is questionable. The highly industrialized states of the United States had a higher per capita increase in

[6] See Table 24.

[7] See Table 25.

personal income for the two periods combined, whether or not there was a state general sales tax. For example, Delaware, with no state general sales tax either in 1947 or 1955, had a composite increase for the two periods under study of approximately $1650. This was the highest increase in the nation. On the other hand, Connecticut, the second highest state in composite per capita personal income increase for the two periods, had a state general sales tax both in 1947 and 1955. The industrialized states of the Middle Atlantic region and the East North Central region had relatively high increases in per capita personal income for the two periods combined, irrespective of the existence of a state general sales tax. On the other hand, neither Montana nor Idaho had a state general sales tax either in 1947 or 1955. But the composite increase in per capita personal income for each of these states ranked among the lowest in the United States. Similarly, other states with a low level of industrial development tend to show relatively small increases in per capita personal income for the two periods, irrespective of the existence of a state general sales tax.

Proposition 36

Per capita value added by manufacture (Y_9, Y_{10}) tends to increase more rapidly where state corporate income taxes (X_{25}, X_{26}) do not exist.

Tests for Validity

Again the same ordering process is employed to determine whether or not states with no corporate income tax have the greatest increase in per capita value added by manufacture.

Test results and discussion. In the first period,[8] 35 percent of the states had per capita value added by manufacture increases above the mean. Of the states having no state corporate income tax in 1947, approximately 47 percent had per capita value added by manufacture increases above the mean. In the second period,[9] 54 percent of the states had per capita value added by manufacture increases above the mean. Of the states having no state corporate income tax in 1955, approximately 60 percent had per capita value added by manufacture increases above the mean. These results lend weak support to the hypothesis that per capita value added by manufacture tends to increase more rapidly where state corporate income taxes do not exist. Nevertheless, a careful examination of Tables 26 and 27 reveals that, in general, the highly industrialized states had a relatively large composite increase in per capita value added by manufacture, irrespective of the existence or nonexistence of state corporate income taxes. On the other hand, states that depend to a smaller extent on non-manufacturing production for their state income had a relatively low composite increase in per capita value added by manufacture, irrespective of the existence or nonexistence of state corporate income taxes.

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[8] See Table 26.

[9] See Table 27.

TABLE 22. Relationship of per capita personal income changes, 1947-1954, to the existence of state personal income taxes in 1947, by states.

Rank	State	Y_3, Per capita personal income changes, 1947-1954 [1]	X_{21}, Existence of state personal income tax in 1947
1	Delaware	$ 928.32	Yes
2	New Jersey	788.38	No
3	Connecticut	775.42	Yes
4	Michigan	710.67	Yes
5	Nevada	652.57	No
6	Maryland	640.13	Yes
7	Ohio	595.89	Yes
8	Indiana	589.27	No
9	California	564.18	Yes
10	Illinois	548.16	No
11	Virginia	533.39	Yes
12	Missouri	533.38	Yes
13	Massachusetts	529.45	Yes
14	Florida	514.64	No
15	Pennsylvania	511.58	No
16	Texas	509.99	No
17	Arizona	487.00	Yes
18	Washington	477.11	No
19	Rhode Island	469.04	No
20	Oklahoma	468.11	Yes
21	Colorado	442.09	Yes
22	New Hampshire	438.54	Yes
23	Kansas	430.02	Yes
24	New Mexico	427.97	Yes
25	Louisiana	425.37	Yes
26	Oregon	425.14	Yes
27	Minnesota	422.80	Yes
28	Wisconsin	421.96	Yes
29	New York	417.74	Yes
30	Georgia	402.68	Yes
31	Wyoming	362.50	No
32	North Carolina	359.17	Yes
33	South Carolina	348.02	Yes
34	Tennessee	339.55	Yes
35	Alabama	333.68	Yes
36	Utah	332.86	Yes
37	Maine	329.04	No
38	Nebraska	321.65	No
39	Iowa	314.87	Yes
40	Vermont	262.88	Yes

Table 22. (Continued)

Rank	State	Y_3, Per capita personal income changes, 1947-1954 [1]	X_{21}, Existence of state personal income tax in 1947
41	Mississippi	252.14	Yes
42	Arkansas	237.49	Yes
43	Montana	225.19	Yes
44	Idaho	206.79	Yes
45	Kentucky	115.70	Yes
46	South Dakota	- 53.99	No
47	North Dakota	-119.40	Yes
48	West Virginia	-247.04	No

[1] The mean of Y_3 is $416.71. The horizontal line separating the ordinals 29 and 30 divides values above the mean from those below the mean.

Source: Y_3 Personal income: U. S. Bureau of the Census, Statistical Abstract of the United States, 1949, p. 284; 1950, p. 266; 1953, p. 299; 1955, p. 311. Population: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 72, p. 3; No. 304, p. 10.

X_{21} The Council of State Governments, The Books of the States: 1948-49, p. 230.

TABLE 23. Relationship of per capita personal income changes, 1954-1962, to the existence of state personal income taxes in 1955, by states.

Rank	State	Y_4, Per capita personal income changes, 1954-1962 [1]	X_{22}, Existence of a state personal income tax in 1955
1	Massachusetts	$ 779.74	Yes
2	Nevada	723.70	No
3	New York	717.85	Yes
4	Maryland	703.45	Yes
5	North Dakota	694.65	Yes
6	Connecticut	687.92	No
7	California	678.51	Yes
8	Illinois	665.71	No
9	Colorado	650.34	Yes

Table 23. (Continued)

Rank	State	Y_4, Per capita personal income changes, 1954-1962 [1]	X_{22}, Existence of a state personal income tax in 1955
10	Nebraska	640.55	No
11	Delaware	631.85	Yes
12	Missouri	624.23	Yes
13	New Hampshire	614.82	Yes
14	New Jersey	608.50	No
15	South Dakota	607.77	No
16	Iowa	588.08	Yes
17	Vermont	586.22	Yes
18	Oregon	584.08	Yes
19	Minnesota	579.06	No
20	Wisconsin	546.48	Yes
21	Wyoming	538.05	No
22	Kansas	531.53	Yes
23	Utah	528.57	Yes
24	Pennsylvania	499.75	No
25	Arizona	496.84	Yes
26	North Carolina	494.31	Yes
27	West Virginia	482.83	No
28	Indiana	477.99	No
29	Arkansas	475.54	Yes
30	Georgia	470.76	Yes
31	Florida	470.07	No
32	Virginia	469.29	Yes
33	Washington	466.43	No
34	Tennessee	462.27	Yes
35	Oklahoma	453.86	Yes
36	Rhode Island	452.56	No
37	Maine	447.90	No
38	New Mexico	438.09	Yes
39	Alabama	434.91	Yes
40	Kentucky	427.09	Yes
41	Idaho	424.08	Yes
42	Texas	412.92	No
43	Ohio	383.77	No
44	South Carolina	383.26	Yes
45	Louisiana	377.13	Yes
46	Mississippi	375.81	Yes
47	Montana	353.61	Yes
48	Michigan	305.45	Yes

[1] The mean of Y_4 is \$530.17. The horizontal line separating the ordinals 22 and 23 divides values above the mean from those below the mean.

Table 23. (Continued)

Sources: Y_4 Personal income: U. S. Bureau of the Census, Statistical Abstract of the United States, 1953, p. 299; 1955, p. 311; 1964, p. 329; and U.S.D.C., Office of Business Economics, Survey of Current Business, 1964, Vol. 44, No. 8, August, p. 16. Population: Current Population Reports, Series P - 25, No. 304, p. 10; and Statistical Abstract, 1964, p. 11.

X_{22} The Council of State Governments, The Books of the States: 1956-57, p. 228.

TABLE 24. Relationship of per capita personal income changes, 1947-1954, to the existence of state general sales taxes in 1947, by states.

Rank	State	Y_3, Per capita personal income changes 1947-1954[1]	X_{23}, Existence of state general sales tax in 1947
1	Delaware	$ 928.32	No
2	New Jersey	788.38	No
3	Connecticut	775.42	Yes
4	Michigan	710.67	Yes
5	Nevada	652.57	No
6	Maryland	640.13	Yes
7	Ohio	595.89	Yes
8	Indiana	589.27	Yes
9	California	564.18	Yes
10	Illinois	548.16	Yes
11	Virginia	533.39	No
12	Missouri	533.38	Yes
13	Massachusetts	529.45	No
14	Florida	514.64	No
15	Pennsylvania	511.58	No
16	Texas	509.99	No
17	Arizona	487.00	Yes
18	Washington	477.11	Yes
19	Rhode Island	469.04	Yes
20	Oklahoma	468.11	Yes
21	Colorado	442.09	Yes
22	New Hampshire	438.54	No
23	Kansas	430.02	Yes
24	New Mexico	427.97	Yes
25	Louisiana	425.37	Yes
26	Oregon	425.14	No
27	Minnesota	422.80	No

Table 24. (Continued)

Rank	State	Y_3, Per capita personal income changes 1947-1954[1]	X_{23}, Existence of state general sales tax in 1947
28	Wisconsin	$ 421.96	No
29	New York	417.74	No
30	Georgia	402.68	No
31	Wyoming	362.50	Yes
32	North Carolina	359.17	Yes
33	South Carolina	348.02	No
34	Tennessee	339.55	Yes
35	Alabama	333.68	Yes
36	Utah	332.86	Yes
37	Maine	329.04	No
38	Nebraska	321.65	No
39	Iowa	314.87	Yes
40	Vermont	262.88	No
41	Mississippi	252.14	Yes
42	Arkansas	237.49	Yes
43	Montana	225.19	No
44	Idaho	206.79	No
45	Kentucky	115.70	No
46	South Dakota	- 53.99	Yes
47	North Dakota	- 119.40	Yes
48	West Virginia	- 247.04	Yes

[1] See Table 22, Footnote 1.

Sources: Y_3 Personal income: U. S. Bureau of the Census, Statistical Abstract of the United States, 1949, p. 284; 1950, p. 266; 1953, p. 299; 1955, p. 311. Populations: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 72, p. 3; No. 304, p. 10.

X_{23} The Council of State Governments, The Books of the States: 1948-49, p. 233.

TABLE 25. Relationship of per capita personal income changes, 1954-1962, to the existence of state general sales taxes in 1955, by states.

Rank	State	Y_4, Per capita personal income changes, 1954-1962 [1]	X_{24}, Existence of state general sales tax in 1955
1	Massachusetts	$ 779.74	No
2	Nevada	723.70	Yes
3	New York	717.85	No
4	Maryland	703.45	Yes
5	North Dakota	694.65	Yes
6	Connecticut	687.92	Yes
7	California	678.51	Yes
8	Illinois	665.71	Yes
9	Colorado	650.34	Yes
10	Nebraska	640.55	No
11	Delaware	631.85	No
12	Missouri	624.23	Yes
13	New Hampshire	614.82	No
14	New Jersey	608.50	No
15	South Dakota	607.77	Yes
16	Iowa	588.08	Yes
17	Vermont	586.22	No
18	Oregon	584.08	No
19	Minnesota	579.06	No
20	Wisconsin	546.48	No
21	Wyoming	538.05	Yes
22	Kansas	531.53	Yes
23	Utah	528.57	Yes
24	Pennsylvania	499.75	Yes
25	Arizona	496.84	Yes
26	North Carolina	494.31	Yes
27	West Virginia	482.83	Yes
28	Indiana	477.99	Yes
29	Arkansas	475.54	Yes
30	Georgia	470.76	Yes
31	Florida	470.07	Yes
32	Virginia	469.29	No
33	Washington	466.43	Yes
34	Tennessee	462.27	Yes
35	Oklahoma	453.86	Yes
36	Rhode Island	452.56	Yes
37	Maine	447.90	Yes
38	New Mexico	438.09	Yes
39	Alabama	434.91	Yes
40	Kentucky	427.09	No
41	Idaho	424.08	No

Table 25. (Continued)

Rank	State	Y_4, Per capita personal income changes, 1954-1962 [1]	X_{24}, Existence of state general sales tax in 1955
42	Texas	$ 412.92	No
43	Ohio	383.77	Yes
44	South Carolina	383.26	Yes
45	Louisiana	377.13	Yes
46	Mississippi	375.81	Yes
47	Montana	353.61	No
48	Michigan	305.45	Yes

[1] See Table 23, Footnote 1.

Sources: Y_4 Personal income: U. S. Bureau of the Census, Statistical Abstract of the United States, 1953, p. 299; 1955, p. 311; 1964, p. 329; and U.S.D.C., Office of Business Economics, Survey of Current Business, 1964, Vol. 44, No. 8, August, p. 16. Population: Current Population Reports, Series P-25, No. 304, p. 10; and Statistical Abstract, 1964, p. 11.

X_{24} The Council of State Governments, The Books of the States: 1956-57, p. 230.

TABLE 26. Relationship of per capita value added by manufacture changes, 1947-1954, to the existence of state corporate income taxes in 1947, by states.

Rank	State	Y_9, Per capita value added by manufacture changes, 1947-1954 [1]	X_{25}, Existence of a state corporate income tax in 1947
1	Michigan	$ 671.81	No
2	Connecticut	495.90	Yes
3	Ohio	458.66	No
4	Indiana	423.33	No
5	Delaware	387.13	No
6	New Jersey	356.60	No
7	Pennsylvania	351.53	Yes
8	Illinois	301.51	No
9	California	299.40	Yes
10	Wisconsin	298.96	Yes
11	Kansas	276.42	Yes
12	Missouri	272.11	Yes

Table 26. (Continued)

Rank	State	Y_9, Per capita value added by manufacture changes, 1947-1954[1]	X_{29}, Existence of a state corporate income tax in 1947
13	Massachusetts	$ 261.88	Yes
14	New York	259.67	Yes
15	Washington	239.22	No
16	Tennessee	237.98	Yes
17	Maryland	230.40	Yes
18	Utah	213.09	Yes
19	Vermont	211.71	Yes
20	Texas	209.43	No
21	West Virginia	199.23	No
22	New Hampshire	198.30	No
23	Iowa	196.44	Yes
24	Kentucky	189.24	Yes
25	Oregon	184.15	Yes
26	Nevada	181.32	No
27	Alabama	173.03	Yes
28	Georgia	169.86	Yes
29	Louisiana	168.54	Yes
30	Maine	165.95	No
31	Minnesota	163.44	Yes
32	Virginia	151.24	Yes
33	Arkansas	146.90	Yes
34	Rhode Island	143.63	Yes
35	North Carolina	139.24	Yes
36	South Carolina	138.32	Yes
37	Nebraska	121.50	No
38	Idaho	120.34	Yes
39	Oklahoma	120.19	Yes
40	Mississippi	115.04	Yes
41	Colorado	114.42	Yes
42	Florida	106.87	No
43	Montana	106.58	Yes
44	Arizona	92.72	Yes
45	New Mexico	77.22	Yes
46	Wyoming	55.82	No
47	South Dakota	33.74	Yes
48	North Dakota	17.37	Yes

[1] The mean of Y_9 is $213.49. The horizontal line separating the ordinals 17 and 18 divides values above the mean from those below the mean.

Sources: Y_9 Value added: U. S. Bureau of the Census, Statistical Abstract of the United States, 1955, pp. 816-17; 1952,

Table 26. (Continued)

p. 782; 1959, pp. 788-89. Population: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 72, p. 3; No. 304, p. 10.

X_{25} The Council of State Governments, The Books of the States: 1948-49, p. 231.

TABLE 27. Relationship of per capita value added by manufacture changes, 1954-1962, to the existence of state corporate income taxes in 1955, by states.

Rank	State	Y_{10}, Per capita value added by manufacture changes, 1954-1962[1]	X_{26}, Existence of a state corporate income tax in 1955
1	Massachusetts	$ 386.73	Yes
2	North Carolina	286.70	Yes
3	Utah	265.75	Yes
4	West Virginia	256.19	No
5	Tennessee	240.21	Yes
6	South Carolina	233.73	Yes
7	Washington	233.46	No
8	Colorado	225.05	Yes
9	Michigan	221.49	No
10	Iowa	213.34	Yes
11	Kentucky	209.68	Yes
12	Indiana	200.47	No
13	Rhode Island	195.84	Yes
14	Missouri	195.26	Yes
15	Minnesota	194.96	Yes
16	Wisconsin	184.83	Yes
17	California	181.72	Yes
18	New Jersey	180.77	No
19	Illinois	178.46	No
20	Arkansas	178.14	Yes
21	Georgia	169.03	Yes
22	Texas	162.22	No
23	New Hampshire	159.76	No
24	Nebraska	153.35	No
25	Virginia	148.33	Yes
26	Vermont	144.61	Yes
27	Connecticut	136.44	Yes
28	Alabama	131.85	Yes
29	Florida	124.71	No
30	New York	119.96	Yes

Table 27. (Continued)

Rank	State	Y_{10}, Per capita value added by manufacture changes, 1954-1962[1]	X_{26}, Existence of a state corporate income tax in 1955
31	Oregon	$ 118.95	Yes
32	Mississippi	114.36	Yes
33	Maryland	110.44	Yes
34	Idaho	103.92	Yes
35	Arizona	92.81	Yes
36	Ohio	92.57	No
37	Maine	87.69	No
38	Pennsylvania	68.22	Yes
39	Oklahoma	60.56	Yes
40	Kansas	56.99	Yes
41	South Dakota	56.63	Yes
42	Montana	48.53	Yes
43	Wyoming	39.13	No
44	Louisiana	35.93	Yes
45	North Dakota	30.39	Yes
46	Delaware	11.71	No
47	New Mexico	-40.58	Yes
48	Nevada	-69.99	No

[1] The mean of Y_{10} is $144.40. The horizontal line separating the ordinals 26 and 27 divides values above the mean from those below the mean.

Sources: Y_{10} Value added: U. S. Bureau of the Census, Statistical Abstract of the United States, 1955, pp. 816-17; 1959 pp. 788-89; 1963, pp. 782-83; 1964, pp. 778-79. Population: Current Population Reports, No. 304, p. 10; Statistical Abstract, 1964, p. 11.

X_{26} The Council of State Governments, The Books of the States: 1956-57, p. 229.

CHAPTER IV

CONCLUSIONS

This is the report of an inquiry undertaken to examine the relationship between state and local tax burdens and state economic growth. The model embraces 26 measurements of state and local tax burdens (tax burden indexes or independent variables) and 18 measurements of state economic growth (growth indexes or dependent variables). It covers 48 states and the years 1947 through 1962. The total time span is separated into two periods: 1947 through 1954, and 1954 through 1962. The basic methodology employed involves simple correlation and regression analysis.

The Findings

Apart from the expected direct association between the absolute state growth variables and the absolute tax burden variables, the results of the investigation failed to provide evidence of a reliable relationship between differentials in state and local tax burdens and differentials in state economic growth.

The same conclusion is inferred from the results whether the computations involve independent variables representing aggregate state and local tax collections, state business tax collections, state general sales tax collections, or state personal income tax collections.

The high direct associations revealed in the correlations between absolute tax variables and absolute growth variables were

envisioned.[1] Large industrialized states have such an economic head-start that they grow more rapidly on an absolute basis than do less industrialized states, and at the same time exact a greater quantity of tax revenue than do the latter. Since large size is compatible with large change in both the dependent and independent variables, the bias toward positive correlation is apparent. These results in no way prejudice the overall conclusions that state and local tax burdens are of little value as predictors of state economic growth.

Of the 87 correlations involving rate of change and ratio variables, only seven resulted in coefficients which were statistically significant at the .05 level. Each of the seven statistically significant coefficients (two of which are positive and five negative) is associated with separate propositions. The coefficient of determination in each instance is of moderate value ranging from a high of .314 to a low of .087. None of the significant coefficients resulting from a test of a given hypothesis is supported by the two accompanying tests of the same hypothesis. In fact, from the sample of 99 correlations (12 correlations involving absolute variables and 87 correlations involving rate of change and ratio variables), the few that are statistically significant and unexplained (seven) barely exceed the number (five) which would have arisen through pure change.

Our analysis provides virtually no evidence that higher than average aggregate state and local taxes have restricted growth, or that lower than average taxes have encouraged growth. Our findings contradict the contention that manufacturing activity flourishes and business

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[1]See Table 28 for a recapitulation of correlation values.

TABLE 28. Recapitulation of correlation coefficients.

Proposition	First period	Second period	Time lag
1	.936	.960	.946
2	.894	.901	.801
3	.081	.471	.465
4	-.538	.018	.070
5	-.560	-.128	-.116
6	.099	-.257	-.190
7	.154	.218	.282
8	.151	-.118	-.046
9	.062	-.098	-.062
10	-.314	.185	.207
11	-.010	.205	.234
12	.049	.096	.122
13	-.427	.048	.065
14	-.079	.278	.270
15	-.0062	.187	.186
16	.664	.868	.703
17	.652	.790	.601
18	-.184	.468	.414
19	-.000445	.219	.148
20	-.266	.075	.151
21	-.067	.253	.308
22	-.044	.247	.288
23	.045	.242	.353
24	.202	.020	.028
25	-.294	.036	.083
26	-.131	.060	.080
27	.094	.072	.087
28	-.037	.115	.068
29	.193	.177	.173
30	.026	-.041	-.0087
31	-.037	.014	.026
32	-.155	.0047	.038
33	-.030	.117	.091

investments are greater where industrial tax loads are lower. The overall results seem to indicate that business locational decisions are not made on the basis of state business tax differentials. The influence of tax differences is likely to be relatively small when compared to more fundamental considerations such as markets and the deviations in labor and raw material costs.

The specific findings are:

1. High total state and local tax burdens upon the entire populace are associated with rapid absolute growth. This was the result expected when we tested the general proposition that the total quantity of economic expansion is greater in states where the total tax bill is lower. The reader is referred to Section 3 of Chapter III for an explanation of the positive correlations.

2. There is little evidence of an association between the deviations in the per capita growth indexes[2] and deviations in state and local taxes as a percent of total personal income.

3. Only a minor fraction of the deviations in the rate of growth indicators are statistically explained by the deviations in per capita state and local taxes.

4. There is no reliable relationship between differentials in state-by-state rates of growth and differentials in state and local taxes as a percent of total personal income.

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[2]The inquiry employs three growth index groups (dependent variable groups): change in personal income, change in value added by manufacture, and change in capital expenditures by manufacterers for new plant and equipment.

5. State-by-state deviations in the rate of growth indexes are not associated with deviations in indexes which represent total state and local taxes as a percent of total personal income divided by per capita personal income.

6. Our results discredit the naive proposition that economic expansion and growth on an absolute basis is greater where total state business taxes are lower; the reverse proposition is strongly supported. The reader is referred to Section 18 of Chapter III for an explanation of these findings.

7. There is little evidence of an association between differentials in per capita growth variables and differentials in total state business taxes as a percent of capital expenditures by manufacturers for new plant and equipment.

8. Variations in the rate of growth variables are not reliably associated with variations in variables which represent total state business taxes as a percent of value added by manufacture.

9. The level of total state and local property taxes as a percent of total personal income is a very insensitive barometer of state by state rate of growth differentials.

10. Differentials in state-by-state rates of growth are not reliably related to differentials in total state general sales taxes as a percent of total personal income.

11. Virtually none of the deviations in the rate of growth variables are associated with the deviations in the variables which represent total state personal income taxes as a percent of total personal income.

12. Changes in per capita personal income are not related to the mere existence of either a state personal income tax or a state general sales tax.

13. Changes in per capita value added by manufacture are not associated with the mere existence of a state corporate income tax.

Explanation of the Findings

Why is it that differentials in state and local tax burdens are not inversely associated with differentials in state economic growth? One presumption is that state and local tax collections, at the levels which existed during the periods of time under study, were so relatively small that they were unimportant expenditures (costs) to both the household sector and the business sector. An accompanying presumption involves the state government as a business intermediary. The process of state and local taxation transfers purchasing power from the private sector to the state government which, in turn, returns the revenues to households and business as payment for goods and services. Along with these governmental outlays to households and business, the state is furnishing services and providing facilities to the entire private sector. In keeping with free enterprise philosophy, and subject to the "will of the people," these services are furnished and facilities are provided by the state government only when it can more efficiently do so. As a result, the real income of the citizens in the state is increased. The private sector enjoys services and facilities according to the amount of the tax collections: i.e., those states with relatively larger tax burdens provide their citizens with more and better services

and facilities. And, as a state becomes more productive, its citizens demand more and more from the state government in the form of services and facilities, such as, for example, better administration, schools, and mental institutions. Thus, it may be inferred that taxes are paid in relation to the economic affluence of a given state.

APPENDIX

DEFINITIONS OF SELECTED TERMS

State income. State income is the aggregate of earnings by labor and property from the state's current production of goods and services. The sum represents compensation of employees, proprietors' income, rental income, net interest and corporate profits. Thus it measures the total factor costs of the goods and services produced by the economy. Earnings are inclusive of taxes.[1]

Personal income. Personal income is the current income received by individuals, by unincorporated business, and by nonprofit institutions (including pension, trust, and welfare funds) from all sources. It includes transfers (payments not resulting from current production) from government and business such as social security benefits, military pensions, etc., but excludes transfers among persons. Although most of the income is in a monetary form, there are important nonmonetary inclusions --chiefly estimated net rental value to owner-occupants of their homes and the value of food consumed on farms.[2]

Disposable personal income. Disposable personal income equals personal income less taxes on individuals (Including income, property, and other taxes not deductible as business expense).[3]

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[1] U. S. Bureau of the Census, Statistical Abstract of the United States, 1959, p. 318.

[2] Ibid., p. 318.

[3] Ibid., p. 318.

Manufacturing. Manufacturing is defined as the mechanical or chemical transformation of inorganic or organic substances into new products. The assembly of compact parts or products is also considered to be manufacturing if the resulting product is neither a structure nor other fixed plant improvement. These activities are usually carried on in plants, factories, or mills, which characteristically use power-driven machines and material-handling equipment.[4]

Value added by manufacture, unadjusted. Unadjusted value added by manufacture is obtained by subtracting the cost of materials, supplies and containers, fuel, purchased electric energy, and contract work from the value of shipments for products manufactured plus receipts for services rendered.[5]

Value added by manufacture, adjusted. Value added by manufacture, adjusted, is equal to unadjusted value plus value added by merchandising operations plus the net change in finished goods and work in process inventories between the beginning and the end of the year.[6]

Expenditures by manufacturers for new plant and equipment. Expenditures made during the year for permanent additions and major alterations to plants as well as for new machinery and equipment purchases that were chargeable to fixed-asset accounts of manufacturing

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[4]U. S. Bureau of the Census, Census of Manufactures: 1958, Vol. I, Summary Statistics, p. 2.

[5]U. S. Bureau of the Census, Annual Survey of Manufactures: 1962, p. 15.

[6]Ibid., p. 15.

establishments and were of a type for which depreciation accounts are ordinarily maintained. Expenditures for machinery and equipment include those made for replacement purposes, as well as for additions to plant capacity. Excluded from such expenditure totals are costs of maintenance and repairs charged as current operating expense. Also excluded are expenditures made by owners of plants and equipment leased to reporting manufacturers.[7]

Economic growth. For the purpose of this inquiry, economic growth is represented by an increase from one period to the next in the value of any one of the designated growth indicators on an absolute, per capita, or percentage basis.

Taxes. Contributions exacted of persons, corporations, and other organizations by the government, according to law, for the government's general support and for the maintenance of public services. Amounts received by a government from a tax it imposes are counted as tax revenue of that government, even though initially collected by another government; in such instances, however, any amounts retained by the collecting government are treated as its tax revenue.

Sales and gross receipts taxes. Taxes, including "licenses" at more than nominal rates, based on volume or value of transfers of goods or services, upon gross receipts therefrom, or upon gross income, and related taxes based upon use, storage, production (other than severance

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[7]U. S. Bureau of the Census, Census of Manufacturers: 1958, Vol. I, Summary Statistics, p. 14.

of national resources), importation, or consumption of goods.[8]

General sales or gross receipts taxes. Comprises sales or gross receipts taxes which are applicable with only specified exceptions to all types of goods and services, or all gross income. Taxes imposed distinctively upon sales of or gross receipts from selected commodities, services, or businesses are considered separately.[9]

License taxes. Taxes enacted (either for revenue raising or for regulation) as a condition to the exercise of a business or non-business privilege, at a flat rate or measured by such bases as capital stock, capital surplus, number of business units, or capacity. Excludes taxes measured directly by transactions, gross or net income, or value of property except those to which only nominal rates apply.[10]

License taxes: Occupations and businesses not elsewhere classified. License taxes (including examination and inspection fees) required of persons engaging in particular professions, trades, or occupations, and such taxes on businesses not elsewhere classified. Includes charges relating to inspection and marketing of seed, feed, fertilizer, gasoline, oil, citrus fruit, and other commodities, as well as licenses relating to particular business enterprises.[11]

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[8]U. S. Bureau of the Census, Compendium of State Government Finances in 1962, p. 65.

[9]Ibid., p. 65.

[10]Ibid., p. 61.

[11]Ibid., p. 63.

License taxes: Corporations in general. Franchise license taxes, organization, filing and entrance fees, and other license taxes, which are applicable, with only specified exceptions to all corporations.[12]

Property taxes. Taxes conditional on ownership of property and measured by its value. Includes general property taxes relating to property as a whole, real and personal, tangible or intangible, whether taxed at a single rate or at classified rates; and taxes on selected types of property, such as motor vehicles or certain intangibles.[13]

Individual income taxes. Taxes on individuals measured by net income including distinctive taxes on income from interest, dividends, and the like.[14]

Corporation net income taxes. Taxes on corporations and unincorporated businesses (when taxed distinctively from individual income) measured by net income.[15]

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[12] Ibid., p. 61.

[13] Ibid., p. 63.

[14] Ibid., p. 60.

[15] Ibid., p. 58.

TABLE 29. Basic variables.

Coding symbols	Letter indicators	Description
01	I	Personal income, by states.
02	V	Value added by manufacture, by states.
03	C	Capital expenditure by manufacturers for new plant and equipment, by states.
04	N	Population, by states.
05	T	Total state and local taxes, by states.
06	G	State and local property taxes, by states.
07	S	State general sales taxes, by states.
08	P	State personal income taxes, by states.
09	B'	State corporate net income taxes, by states.
10	B''	License revenues: corporations in general, by states.
11	B'''	License revenues: occupations and business not elsewhere classified by states.
12	B	Total state business taxes (B' plus B'' plus B'''), by states.
13	P_e	Existence or nonexistence of a state individual income tax, by states.
14	S_e	Existence or nonexistence of a state general sales tax, by states.
15	B'_e	Existence or nonexistence of a state corporate income tax, by states.

TABLE 30. State (k) subscript designators

1. Alabama
2. Arizona
3. Arkansas
4. California
5. Colorado
6. Connecticut
7. Delaware
8. Florida
9. Georgia
10. Idaho
11. Illinois
12. Indiana
13. Iowa
14. Kansas
15. Kentucky
16. Louisiana
17. Maine
18. Maryland
19. Massachusetts
20. Michigan
21. Minnesota
22. Mississippi
23. Missouri
24. Montana
25. Nebraska
26. Nevada
27. New Hampshire
28. New Jersey
29. New Mexico
30. New York
31. North Carolina
32. North Dakota
33. Ohio
34. Oklahoma
35. Oregon
36. Pennsylvania
37. Rhode Island
38. South Carolina
39. South Dakota
40. Tennessee
41. Texas
42. Utah
43. Vermont
44. Virginia
45. Washington
46. West Virginia
47. Wisconsin
48. Wyoming

TABLE 31. Year (j) subscript designators.

1.	1946
2.	1947
3.	1948
4.	1949
5.	1950
6.	1951
7.	1952
8.	1953
9.	1954
10.	1955
11.	1956
12.	1957
13.	1958
14.	1959
15.	1960
16.	1961
17.	1962
18.	1963

Formulas Employed to Calculate the Dependent Variables

$$Y_{1,k} = 1/3 \sum_{j=8}^{10} I_{k,j} - 1/3 \sum_{j=1}^{3} I_{k,j}$$

$$Y_{2,k} = 1/3 \sum_{j=16}^{18} I_{k,j} - 1/3 \sum_{j=8}^{10} I_{k,j}$$

$$Y_{3,k} = 1/3 \sum_{j=8}^{10} \left(\frac{I_{k,j}}{N_{k,j}}\right) - 1/3 \sum_{j=1}^{3} \left(\frac{I_{k,j}}{N_{k,j}}\right)$$

$$Y_{4,k} = 1/3 \sum_{j=16}^{18} \left(\frac{I_{k,j}}{N_{k,j}}\right) - 1/3 \sum_{j=8}^{10} \left(\frac{I_{k,j}}{N_{k,j}}\right)$$

$$Y_{5,k} = \frac{1/3 \sum_{j=8}^{10} I_{k,j} - 1/3 \sum_{j=1}^{3} I_{k,j}}{1/3 \sum_{j=1}^{3} I_{k,j}}$$

$$Y_{6,k} = \frac{1/3 \sum_{j=16}^{18} I_{k,j} - 1/3 \sum_{j=8}^{10} I_{k,j}}{1/3 \sum_{j=8}^{10} I_{k,j}}$$

$$Y_{7,k} = 1/3 \sum_{j=8}^{10} V_{k,j} - 1/2 \, (V_{k,2} + V_{k,4})$$

$$Y_{8,k} = 1/2 \sum_{j=16}^{17} V_{k,j} - 1/3 \sum_{j=8}^{10} V_{k,j}$$

$$Y_{9,k} = 1/3 \sum_{j=8}^{10} \left(\frac{V_{k,j}}{N_{k,j}}\right) - 1/2 \left(\frac{V_{k,2}}{N_{k,2}} + \frac{V_{k,4}}{N_{k,4}}\right)$$

$$Y_{10,k} = 1/2 \sum_{j=16}^{17} \left(\frac{V_{k,j}}{N_{k,j}}\right) - 1/3 \sum_{j=8}^{10} \left(\frac{V_{k,j}}{N_{k,j}}\right)$$

$$Y_{11,k} = \frac{1/3 \sum_{j=8}^{10} V_{k,j} - 1/2 (V_{k,2} + V_{k,4})}{1/2 (V_{k,2} + V_{k,4})}$$

$$Y_{12,k} = \frac{1/2 \sum_{j=16}^{17} V_{k,j} - 1/3 \sum_{j=8}^{10} V_{k,j}}{1/3 \sum_{j=8}^{10} V_{k,j}}$$

$$Y_{13,k} = 1/2 \sum_{j=9}^{10} C_{k,j} - 1/2 \sum_{j=6}^{7} C_{k,j}$$

$$Y_{14,k} = 1/2 \sum_{j=16}^{17} C_{k,j} - 1/2 \sum_{j=9}^{10} C_{k,j}$$

$$Y_{15,k} = 1/2 \sum_{j=9}^{10} \left(\frac{C_{k,j}}{N_{k,j}}\right) - 1/2 \sum_{j=6}^{7} \left(\frac{C_{k,j}}{N_{k,j}}\right)$$

$$Y_{16,k} = 1/2 \sum_{j=16}^{17} \frac{C_{k,j}}{N_{k,j}} - 1/2 \sum_{j=9}^{10} \left(\frac{C_{k,j}}{N_{k,j}}\right)$$

$$Y_{17,k} = \frac{1/2 \sum_{j=9}^{10} C_{k,j} - 1/2 \sum_{j=6}^{7} C_{k,j}}{1/2 \sum_{j=9}^{10} C_{k,j}}$$

$$Y_{18,k} = 1/2 \sum_{j=16}^{17} C_{k,j} - 1/2 \sum_{j=9}^{10} C_{k,j}$$

Formulas Employed to Calculate the Independent Variables

$$X_{1,k} = T_{k,8}$$

$$X_{2,k} = T_{k,8} + T_{k,13}$$

$$X_{3,k} = \frac{T_{k,8}}{I_{k,8}}$$

$$X_{4,k} = \frac{T_{k,8}}{I_{k,8}} + \frac{T_{k,13}}{I_{k,13}}$$

$$X_{5,k} = \frac{T_{k,8}}{N_{k,8}}$$

$$X_{6,k} = \frac{T_{k,8}}{N_{k,8}} + \frac{T_{k,13}}{N_{k,13}}$$

$$X_{7,k} = \frac{T_{k,8}\ N_{k,8}}{I^2_{k,8}}$$

$$X_{8,k} = \frac{T_{k,8}\ N_{k,8}}{I^2_{k,8}} + \frac{T_{k,13}\ N_{k,13}}{I^2_{k,13}}$$

$$X_{9,k} = \sum_{j=2}^{9} B'_{k,j} + \sum_{j=2}^{9} B''_{k,j} + \sum_{j=2}^{9} B'''_{k,j}$$

$$X_{10,k} = \sum_{j=9}^{17} B'_{k,j} + \sum_{j=9}^{17} B''_{k,j} + \sum_{j=9}^{17} B'''_{k,j}$$

$$X_{11,k} = \frac{\sum_{j=6}^{9} B'_{k,j} + \sum_{j=6}^{9} B''_{k,j} + \sum_{j=6}^{9} B'''_{k,j}}{\sum_{j=6}^{9} C_{k,j}}$$

$$X_{12,k} = \frac{\sum_{j=9}^{17} B'_{k,j} + \sum_{j=9}^{17} B''_{k,j} + \sum_{j=9}^{17} B'''_{k,j}}{\sum_{j=9}^{17} C_{k,j}}$$

$$X_{13,k} = \frac{B'_{k,2} + B''_{k,2} + B'''_{k,2} + \sum_{j=4}^{9} B'_{k,j} + \sum_{j=4}^{9} B''_{k,j} + \sum_{j=4}^{9} B'''_{k,j}}{V_{k,2} + \sum_{j=4}^{9} V_{k,j}}$$

$$V_{14,k} = \frac{\sum_{j=9}^{17} B'_{k,j} + \sum_{j=9}^{17} B''_{k,j} + \sum_{j=9}^{17} B'''_{k,j}}{\sum_{j=9}^{17} V_{k,j}}$$

$$X_{15,k} = \frac{G_{k,8}}{I_{k,8}}$$

$$X_{16,k} = \frac{G_{k,8}}{I_{k,8}} + \frac{G_{k,13}}{I_{k,13}}$$

$$X_{17,k} = \frac{\sum_{j=2}^{9} S_{k,j}}{\sum_{j=2}^{9} I_{k,j}}$$

$$X_{18,k} = \frac{\sum_{j=9}^{17} S_{k,j}}{\sum_{j=9}^{17} I_{k,j}}$$

$$X_{19,k} = \frac{\sum_{j=2}^{9} P_{k,j}}{\sum_{j=2}^{9} I_{k,j}}$$

$$X_{20,k} = \frac{\sum_{j=9}^{17} P_{k,j}}{\sum_{j=9}^{17} I_{k,j}}$$

$$X_{21,k} = P_{e,k,2}$$

$$X_{22,k} = P_{e,k,10}$$

$$X_{23,k} = S_{e,k,2}$$

$$X_{24,k} = S_{e,k,10}$$

$$X_{25,k} = B'_{e,k,2}$$

$$X_{26,k} = B'_{e,k,10}$$

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BIBLIOGRAPHY

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